

## An Analytical study of Bacteriological Profiles in Female patients of UTI receiving Ante Natal Care

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Received: 20-06-2021 / Revised: 27-07-2021 / Accepted: 15-08-2021

### Abstract

**Introduction:** 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. This study aimed to assess bacterial profile of urinary tract infection and their antimicrobial susceptibility pattern among pregnant women attending antenatal clinic at nearby local hospitals. **Methods:** For the purpose of the present study, data of 100 of the randomly selected Pregnant patients ( candidates / study subjects ) was taken. This retrospective study was carried out in the Dept. of Microbiology. The urinary pathogens and their antibiotic susceptibility patterns in One year was studied from the records of Microbiology laboratory. **Result:** Among total 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. Due to rising antibiotic resistance among uropathogens, it is necessary to have local hospital based knowledge of the uropathogens and their antibiotic sensitivity patterns.

**Key Words:** UTI, Bacteria, E.coli, ANC

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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[1]. 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[2] and in pregnancy, it may involve the lower urinary tract or the bladder[3]. UTI has been reported among 20% of the pregnant women and it is the most common cause of admission in obstetrical wards[4].

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[5]. 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[6]. Additionally, the apparent reduction in immunity of pregnant women appears to encourage the growth of both commensal and non-commensal micro-organisms[7]. The physiological increase in plasma volume during pregnancy decreases urine concentration and up to 70% pregnant women

develop glucosuria, which encourages bacterial growth in the urine[8]. 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[9].

The organisms causing UTIs during pregnancy are the same as those found in non-pregnant patients. E. coli accounts for 80% - 90% infections[10], about 85% of community acquired UTIs, 50% of nosocomial UTIs and more than 80% of uncomplicated pyelonephritis[11]. 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[12]. 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 nearby local hospitals / Primary health care centers

### Methodology

The study was conducted within ethical standards. Randomization was done using computer tables in selecting data. For the purpose of the present study, data of 100 of the randomly selected Pregnant patients (candidates / study subjects) was taken. This retrospective study was carried out in the Dept. of Microbiology. The urinary pathogens and their antibiotic susceptibility patterns in One year was studied from the records of Microbiology laboratory. It was noted and made sure that 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

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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 urinesample (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]. Data was filled in Microsoft Excel & continuous data were expressed as mean  $\pm$  standard deviation (SD). The data were analyzed by IBM SPSS Statistics 21. Overall,  $p < 0.05$  was proposed to represent statistical significance after correction.

## Results

A total of 124 urine samples were received from pregnant women and processed in Microbiology laboratory in one year. 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%) . 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.

**Table 1: Bacteria**

Bacteria	Number (n)	Percentage (%)
E.coli	19	42.2
Staphylococcus aureus	8	17.8
Cons	7	15.5
Klebsiellasp	5	11.1
Enterococci	3	6.7
Acinetobacter	3	6.7

**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-Amoxi-clav, 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-Amoxi-clav, CTX-Cefotaxime, CTR-Ceftriaxone, CIP-Ciprofloxacin, GEN-Gentamicin, C- Chloramphenicol, NX-Norfloxacin, COT- cotrimoxazole, T-Tetracycline, LZ- linezolid. CONS-Coagulase negative staphylococcus

Bacteriuria, either symptomatic or asymptomatic, is common in pregnancy. If left untreated; 20% - 30% of asymptomatic bacteriuria 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[17], reported a prevalence of 21.7 % ,Onuh et al[18] reported 32.7% and Ajayi et al[19], reported 40%, which is comparable to this study. However Onyemelukwe et al[20] reported a prevalence of 12.7% and Leigh[21], Brook et al[22] 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%), Klebsiellasp (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[23,24]. 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[25]. 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[26].

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[27]. 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.

## Discussion

Bacteriuria, either symptomatic or asymptomatic, is common in pregnancy. If left untreated; 20% - 30% of asymptomatic bacteriuria

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[17], reported a prevalence of 21.7% ,Onuh et al[18] reported 32.7% and Ajayi *et al*[19], reported 40%, which is comparable to this study. However Onyemelukwe et al[20] reported a prevalence of 12.7% and Leigh[21], Brook et al[22] 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[23,24]. 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[25]. 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[26].

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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.

### Acknowledgements

We would like to thank all the participants of the study, HoD & Dean sir.

### Compliance With Ethical Standards.

### Conflict Of Interest

None.

### Funding

None.

### Informed Consent Obtained.

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