

UTI in Pregnancy: Incidence and Antimicrobial Profile

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ABSTRACT

Introduction: Urinary tract infection in pregnancy is associated with significant morbidity for both the mother and the baby. The aim of this study was to determine the bacterial profile and antibiotic resistance pattern of the urinary pathogens isolated from pregnant women at Mata Gujri Memorial Medical College and Hospital, Kishanganj.

Material and methods: A total of 267 pregnant women with and without symptoms of urinary tract infection were enrolled as a study subject from October 2016 to October 2017. Organisms were identified from mid-stream clean catch urine samples and antibiotic susceptibility was performed using bacteriological standard tests. Data were collected using structured questionnaires and were processed and analyzed using SPSS for Windows version 16.

Results: Out of 267 pregnant women, 37 were symptomatic and the rest 230 asymptomatic. Bacteriological screening of urine samples revealed growth of bacteria in 8.5% (7/37) and 18.9% (28/230) for symptomatic and asymptomatic pregnant women respectively with overall prevalence of 9.5%. The most common isolates detected were E.coli (45.7%) followed by coagulase negative Staphylococcus (17.1%). Gram-negative bacteria showed resistance rates in the range of 56.5%-82.6% against trimethoprim/sulfamethoxazole, amoxicillin and ampicillin. Gram positive isolates showed resistant rate ranging from 50-100% against trimethoprim-sulphamethoxazole, amoxicillin and ampicillin. Both Gram positive and gram negative bacteria showed high sensitivity against Nitrofurantoin with a rate of 82.3% and 87%, respectively. All isolated Gram positive bacterial uropathogens were sensitive for Amoxicillin-clavulanic acid.

Conclusion: The isolation of bacterial pathogens both from symptomatic and asymptomatic pregnant women that are resistance to the commonly prescribed drug calls for an early screening of all pregnant women to urinary tract infection.

Keywords: Bacterial Profile, Asymptomatic Bacteriuria (ASB), Antibiotic Resistance, Pregnancy

INTRODUCTION

Urine in the bladder is sterile but during passage from the urethra it becomes contaminated with the resident flora. Presence of bacteria in urine is called bacteriuria. Bacteriuria is said to be significant in the presence of more than 10^5 , however there are many exceptions to this rule. Asymptomatic bacteriuria is defined as the presence of bacteria in urine without any sign or symptoms. This type of infection persists in healthy adults but during pregnancy if left untreated, may lead to acute pyelonephritis, preterm labour, low birth weight foetus.¹⁻⁴ Urinary tract infection rises during pregnancy due to anatomical and physiological changes.^{1,5} Various conditions like eclampsia, pyelonephritis and renal failure can occur in untreated UTI in pregnancy.¹

The American College of Obstetricians and Gynecologists recommends ASB screening in all pregnant women and if a pathogenic organism is cultured then antibiotics to be started at the earliest as the cost effective strategies for improving maternal and neonatal health.^{9,12} Point to be noted here is that the results of screening vary widely and in our country where over the counter medicines are easily available over use of antibiotics may have resulted.²¹ The impact of antimicrobial overuse on the antimicrobial susceptibility of human pathogens causing ABU declines the effectiveness of current and future antimicrobial agents along with the emergence of multidrug resistant bacteria. The most common agent accounting for 80% to 90% of UTIs is E.Coli which are being treated with no antibiotic prejudices causing over reporting of the infection followed by over treatment thereby increasing the resistance plus cost.^{7,8}

The aim of this study was to determine the bacterial profile and antibiotic resistance pattern of the urinary pathogens isolated from pregnant women at Mata Gujri Memorial Medical College and Hospital, Kishanganj.

MATERIAL AND METHODS

This was a cross-sectional study of pregnant women on their first antenatal clinic of the MGM Medical College and hospital. A question based form was used to obtain information from the study participants like identification number, age, phone number, educational level, marital status, parity, gestational age, and human immune virus status.

The inclusion criteria included any pregnant female during her first antenatal visit followed by filling up of the required form along with their consent. However, the women excluded from the study were those who had features of urinary tract infection, fever, had taken antibiotics within 2 weeks of the study, had medical chronic conditions like HIV & Hepatitis, and those who declined to consent despite adequate counselling.

After being given explained the importance of urinary examination, they were given instructions on proper hygienic mid stream urine collection procedure by the nurses and female technical staff. The first part of the urine was voided,

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and approximately 10-15 mL of midstream urine was collected in a sterile universal bottle, that had been correctly labelled and given to the patients. The urine samples in the sterile universal bottles were taken to the laboratory for processing within 1 hour and if delay was expected then they were refrigerated. Routine microscopic examination for pus cells, casts, epithelial cells, crystals, yeast cells was done. After that they were plated on CLED media using calibrated loop of .0002 ml in order to get quantitative culture growth and then incubated for 24 hrs at 37degree and sensitivity was done according to CLSI guidelines. Colony counts yielding bacterial growth of 10⁵ organism/ml or more of pure isolates were deemed significant. Contaminated urine usually has less than 10⁴ organism/ml and often contains more than two bacteria species.¹³ Suspected bacterial species were characterized by colonial morphology, gram stain followed by microscopic examination, motility test and biochemical tests. Isolates were identified to species level using standard methods according to Clinical and Laboratory Standard Institute Guidelines.¹⁴ Kirby-Bauer disk diffusion test was used to perform antimicrobial susceptibility testing for all the isolates as recommended by Clinical and Laboratory Standard Institute.

RESULTS

In our study 267 samples were collected from 245 patients, some required repeat sampling due to contamination of the sample. The mean age of the patients was 24 years(47.3%) and the approximate range was 17 -39 years. Illiterate to graduate females were registered where as most of them were of urban dwelling (70%). Less than 35% visited in the first trimester while maximum visitations was in second

trimester about 50%.35 pathogens was recovered from 33 samples while a majority did not yield any growth .Of the 35 microorganisms 28 were isolated from the 230 asymptomatic patients while 7 were from the 37 symptomatic patients. Among the isolates gram negative were isolated in 23 cases while 12 were gram positive isolates.E.coli was the most frequently isolated organism, in 16 cases (45.7%) with CONS 6 (17%) and Staphylococcus aureus in 1(3.6%) cases. Nonfermentors were seen in 7 cases while Enterococcal species was isolated in 3 cases

From 37 symptomatic pregnant women, 7 bacterial species were isolates of which E. coli was the most common accounting for 57.1%. Ampicillin and amoxicillin were found to be resistant for 82.6 and 77.6% of gram negative isolates. Their resistance against trimethoprim-sulphamethoxazole, chloramphenicol, nalidixic acid, amoxicillin-clavulanic acid, ciprofloxacin, gentamycin, norfloxacin and amikacin ranged from 21.7- 56.2%.Nitrofurantoin was shown to have least resistance for the bacterial isolates maybe due to decreased usage in the last decade causing resurgence of nitrofurantoin sensitive strains. E.coli which constituted for maximum number among (45.7%) Gram negative bacteria showed 56.8%, 68.8%, 75%, and 81.7% resistance against trimethoprim-sulphamethoxazole, tetracycline amoxicillin and ampicillin, respectively.

Nitrofurantoin was the most effective drug against E.coli with sensitivity rate of 93%,while 68.3% of the Gram negative isolates was fully sensitive to nitrofurantoin and ciprofloxacin. However, it was relatively resistant to trimethoprim-sulphamethoxazole (50%), nalidixic acid (50%), kanamycin (50%), amoxicillin-clavulanic acid (50%),

| Isolated bacteria | ABU (N=230) | Symptomatic UTI (N=37) | Total (N=267) |
|-------------------|-------------|------------------------|---------------|
| E.coli | 12(42.9%) | 4(57.1%) | 16(45.7%) |
| Cons | 5(17.9%) | 1(14%) | 6(17.1%) |
| S.aureus | 1(3.6%) | 0 | 1(3.6%) |
| C.fruendii | 1(3.6%) | 0 | 1(3.6%) |
| P.mirabilis | 3(10.7%) | 2(5.7%) | 5(15.3%) |
| P.aeruginosa | 1(3.6%) | 0 | 1(3.6%) |
| K.pneumoniae | 2(7.1%) | 0 | 2(7.1%) |
| Enterococci | 3(10.7%) | 0 | 3(10.7%) |

Table-1: Percentage wise isolate distribution

| | AMP | AMX | CIP | C | SXT | GEN | NIT | NOR | AK | AMC |
|--------------------|-----------|-----------|----------|----------|-----------|----------|---------|----------|-----------|----------|
| E.coli (N=16) | 13(81.2%) | 12(75.5%) | 3(18.7%) | 6(37.5%) | 9(56.26%) | 4(25%) | 1(6.2%) | 7(43.2%) | 11(68.7%) | 6(37.5%) |
| P.mirabilis (N=3) | 2(66.6%) | 1(33.3%) | 2(66.6%) | 2(66.6%) | 1(33.3%) | 1(33.3%) | - | 1(33.3%) | 1(33.3%) | 0 |
| C.fruendii (N=1) | 1(100%) | 1(100%) | 0 | 0 | 1(100%) | 0 | - | - | - | 1(100) |
| P.aeruginosa (N=1) | 1(100%) | 1(100%) | 1(100%) | 1(100) | 0 | 0 | - | - | 1(100) | 1(100) |
| K.pneumoniae (N=2) | - | 0 | 0 | 0 | - | 1(100%) | - | - | 1(100) | 1(100%) |

Table-2: Antibiotic resistance in gram negative isolates

| | AMP | AMX | CIP | C | SXT | GEN | NIT | VA | CX | AK | AMC |
|-------------------|-----------|-----------|-----------|-----------|-----|-----------|-----------|----|-----------|----|-----------|
| S.aureus (N=1) | 1 (100%) | 1 (100%) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Enterococci (N=3) | - | 1 (33.3%) | 1 (33.3%) | 1 (33.3%) | 0 | 1 (33.3%) | 1 (33.3%) | 0 | - | 0 | 1 (33.3%) |
| CONS (N=6) | 2 (33.3%) | 2 (66.6%) | 1 (33.3%) | 0 | 0 | 1 (33.3%) | 0 | 0 | 1 (33.3%) | 0 | 1 (33.3%) |

Table-3: Antibiotic resistance in percentage of gram positive COCCI

amoxicillin (50%), tetracycline (50%) and gentamycin (50%) and fully (100%) resistant to norfloxacin, chloramphenicol and ampicillin (Table 2).

Gram positive isolates showed resistance rate ranging from 50-75% to trimethoprim-sulphamethoxazole, amoxicillin, chloramphenicol (41.7%), ciprofloxacin (25.0%), norfloxacin (25.0%), amikacin (25.0%) and ceftiofloxacin (15.0%). Gram positive bacteria had relatively high sensitivity to gentamicin (83.3%), nitrofurantoin (83.3%) and amoxicillin-clavulanic acid (100%). Coagulase negative staphylococcus (CONS) was the common isolates comprising 50.0% of the Gram positive bacteria and they have shown different level of resistance for tested antibiotics. However, all isolates CNS were susceptible to Amoxicillin-clavulanic acid. Similarly, *S. aureus* was also have shown resistance to most antibiotic but sensitive to ciprofloxacin (100%), kanamycin (100%), gentamycin (100%), norfloxacin (100%) and amoxicillin-clavulnic acid (100%) (Table 3). All the Gram positive isolates and 93.8% of the Gram negatives were multi drug resistant but no vancomycin resistant enterococci nor any MRSA (Methicillin resistant *Staphylococcus aureus*) were seen.

DISCUSSION

The UTI incidence increases drastically in pregnancy due to hormonal changes which in turn may lead to increase in complications. Since the urinary infection maybe both symptomatic and asymptomatic it is pertinent to employ measures for early detection and treatment.

The major contributing factor for isolating higher rate of *E. coli* is due to urine stasis in pregnancy which favors the *E. coli* strain colonization²⁶ due to unhygienic practices. In our finding the second common isolate was CoNS for both and symptomatic UTI which is comparable with others report.²¹ In the present study Gram negative isolates were found with higher rate of resistance to the commonly prescribed antibiotics in the country. All Gram negative isolates were resistance to Ampicillin (approx. 89%). Other studies done in India and abroad have also reported comparable finding on this regard.^{3,17,24} On the other hand, in this study Gram positive bacterial isolates were found relatively sensitive to Vancomycin (100%), Ciprofloxacin (82%), and Ceftiofloxacin (88%) in which these reports are in agreement with the finding of other study.²²

CONCLUSION

Diagnosing urinary tract infection in pregnancy is of pivotal importance since over the counter drug prescriptions have resulted in enormous multi drug resistance. The antenatal checkups at regular intervals ensure that the side effects of UTI do not affect the foetus or the mother. Also it is pertinent to explain hygienic practices to ensure health, since fecal contamination of urine is an important source of urinary infection in pregnancy. Our study did not find any VRE nor MRSA proving that unhygienic practices results in urinary tract infection and not the presence of community acquired infection.^{15,20}

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