



BACTERIOLOGICAL PROFILES AND ANTIBIOTIC SUSCEPTIBILITY PATTERNS OF URINARY TRACT INFECTIONS AMONG PREGNANT WOMEN ATTENDING INDIAN TERTIARY CARE HOSPITAL

Microbiology

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ABSTRACT

Urinary tract infection (UTI) is a common health problem among pregnant women worldwide, especially in developing countries. Urine culture is the gold standard for the detection of asymptomatic bacteriuria. The main objectives of this study were to determine the prevalence of UTI, to identify the causative bacterial agents and, to study their antibiotic susceptibility pattern among pregnant women attending tertiary care hospital. A cross-sectional study was carried out for 2 months duration. A total of 180 urine samples were collected from pregnant women and cultured to identify bacterial agents and tested for antibiotic susceptibility as per CLSI guidelines. The prevalence of UTI was 43(23.9%) among 180 pregnant women. The commonest causative organism was found to be *Escherichia coli* 14(32.6%). The majority of the organisms were sensitive to amikacin, nitrofurantoin, piperacillin-tazobactam, imipenem and more numbers of the organisms were resistant to amoxycylav, nalidixic acid, ceftazidime, norfloxacin, ceftriaxone. The prevalence of asymptomatic UTI was more common among pregnant women than symptomatic UTI.

KEYWORDS

Antibiotic sensitivity, uropathogens, pregnant women, UTI

INTRODUCTION

Urinary tract infection (UTI) is the most common bacterial infection in the human population worldwide and the second most common cause of hospital visits.¹ Approximately 12% of males and 40% of females experience UTI in some part of their lifetime and about 40% of affected women show recurrent UTI.^{2,3} The risk factors for UTI in women may be due to short urethra and its proximity to the anal orifice, absence of prostatic secretions, pregnancy-related hormonal and mechanical changes in the genito-urinary tract. In India, the prevalence of UTI in pregnant women is reported to range from 3-24%.² UTI in pregnant women may present as asymptomatic bacteriuria or symptomatic infection.² Asymptomatic bacteriuria is defined as the presence of significant bacteriuria without the symptoms of an acute UTI which accounts for 70% of cases.⁴ It may lead to maternal complications like hypertension, pre-eclampsia, anemia and neonatal complications like intrauterine growth retardation, low birth weight and pre-term premature rupture of membrane. Symptomatic bacteriuria presents with symptoms like dysuria, fever, abdominal pain, urgency, increased frequency of micturition.⁵ Without treatment, asymptomatic bacteriuria leads to symptomatic cystitis in about 40% of pregnant women and 30% will eventually develop acute pyelonephritis leading to increased antenatal and perinatal complications.⁶ Organisms causing UTI in pregnant women include gram-negative bacteria more commonly than gram-positive bacteria and yeast-like fungi.^{3,6-8} The gold standard for the detection of asymptomatic bacteriuria is urine culture.^{3,7} Hence urine culture is necessary for the isolation and determining antibiotic susceptibility patterns of pathogens associated with UTI. The present study was therefore carried out to determine the prevalence of UTI, to identify the bacterial agents causing UTI, and to study their antibiotic susceptibility patterns among the pregnant women attending our tertiary care hospital.

MATERIALS AND METHODS

A cross-sectional study was conducted at the rural tertiary care hospital, located in south India from July to August 2019. A total of 180 urine specimens were collected from pregnant women with or without symptoms of UTI attending antenatal clinics. Midstream urine specimens were collected using lick proof sterile plastic containers. Within an hour of the collection as per standard microbiological techniques urine culture was done on blood and MacConkey agar. Plates were incubated at 37°C for 18–24 hours and the isolates were identified by standard microbiological methods⁹ and subjected to sensitivity testing by Kirby-Bauer disc diffusion method using antibiotic discs as per CLSI guidelines.¹⁰ Frequencies of various variables were computed and differences between different groups were analyzed using the Chi-square test and a p-value <0.05 was taken as statistically significant. This ICMR project study was started after obtaining ethical approval from the Institutional Ethical Committee. All pregnant women started on antibiotic therapy within the last two weeks were excluded from the study.

RESULTS

Out of 180 pregnant women, a total of 43(23.9%) showed significant bacteriuria in cultures and were considered as laboratory-confirmed cases of UTI.

Table 1: Prevalence of UTI among pregnant women

Pregnant women	Bacteriuria		Total n=180(%)
	Significant n=43(%)	Not significant n=137(%)	
Asymptomatic	38(88.4)	124(90.5)	162(90)
Symptomatic	5(11.6)	13(9.5)	18(10)
Primigravida	19(44.2)	55(40.1)	74(41.1)
Multigravida	24(55.8)	82(59.8)	106(58.9)
1 st Trimester	8(18.6)	38(27.7)	46(25.5)
2 nd Trimester	17(39.5)	44(32.1)	61(33.9)
3 rd Trimester	18(41.9)	55(40.1)	73(40.5)
18-20yrs	4(9.3)	15(10.9)	19(10.5)
21-25yrs	25(58.1)	73(53.3)	98(54.4)
26-30yrs	11(25.6)	32(23.4)	43(23.8)
31-35yrs	2(4.7)	15(10.9)	17(9.4)
36-40yrs	1(2.3)	2(1.5)	3(1.6)

Table 2: Microbiological profiles of UTI among pregnant women

Isolated organisms	Total n=43(%)
Gram-negative organisms	22(51.2)
<i>Escherichia coli</i>	14(32.6)
<i>Klebsiella pneumoniae</i>	6(14)
<i>Proteus mirabilis</i>	1(2.3)
<i>Acinetobacter</i> species	1(2.3)
Gram-positive organisms	20(46.5)
Coagulase negative <i>Staphylococcus</i> (CONS)	13(30.2)
<i>Staphylococcus aureus</i>	3(7)
<i>Enterococcus</i> species	4(9.3)
Yeast like fungi	1(2.3)
Non-albicans <i>Candida</i> species	1(2.3)

Table 3: Antibiotics sensitivity pattern of Gram-negative bacteria

Antibiotics	Organisms				Total n=22 (%)
	<i>Escherichia coli</i> n=14(%)	<i>Klebsiella pneumoniae</i> n=6(%)	<i>Proteus mirabilis</i> n=1(%)	<i>Acinetobacter</i> species n=1(%)	
Ciprofloxacin	10 (71.4)	5 (83.3)	1 (100)	1 (100)	17 (77.3)
Ofloxacin	8 (57.1)	4 (66.7)	1 (100)	1 (100)	14 (63.6)

Norfloxacin	5 (35.7)	3 (50)	1 (100)	0	9 (40.9)
Nitrofurantoin	10 (71.4)	2 (33.3)	0	0	12 (54.5)
Nalidixic acid	1 (7.1)	1 (16.7)	0	0	2 (9.1)
Cotrimoxazole	9 (64.3)	3 (50)	0	0	12 (54.5)
Amikacin	11 (78.6)	6 (100)	1 (100)	1 (100)	19 (86.4)
Gentamicin	10 (71.4)	5 (83.3)	1 (100)	1 (100)	17 (77.3)
Cefepime	8 (57.1)	5 (83.3)	1 (100)	0	14 (63.6)
Ceftazidime	3 (21.4)	2 (33.3)	0	0	5 (22.7)
Ceftriaxone	5 (35.7)	4 (66.7)	1 (100)	1 (100)	11 (50)
Amoxycylav	0	1 (16.7)	0	0	1 (4.5)
Piperacillin-tazobactam	12 (85.7)	5 (83.3)	1 (100)	1 (100)	19 (86.4)
Imipenem	14 (100)	6 (100)	1 (100)	1 (100)	22 (100)

Table 4: Antibiotics sensitivity pattern of Gram-positive bacteria

Antibiotics	Organisms			Total n=20 (%)
	CONS n=13 (%)	<i>Enterococcus</i> spp n=4 (%)	<i>Staphylococcus</i> <i>aureus</i> n=3(%)	
Penicillin	1(7.7)	0	0	1(5)
Oxacillin	3(23.1)	0	0	3(15)
Azithromycin	5(38.5)	0	0	5(25)
Erythromycin	4(30.8)	0	0	4(20)
Vancomycin	10(76.9)	4(100)	2(66.7)	16(80)
Amikacin	13(100)	0	2(66.7)	15(75)
Gentamicin	9(69.2)	0	0	9(45)
Linezolid	11(84.6)	4(100)	3(100)	18(90)
Ciprofloxacin	6(46.2)	0	0	6(30)
Ofloxacin	8(61.5)	1(25)	0	9(45)
Norfloxacin	4(30.8)	0	0	4(20)
Nitrofurantoin	10 (76.9)	4(100)	3(100)	17(85)
Nalidixic acid	3(23.1)	1(25)	0	4(20)
Cotrimoxazole	2(15.4)	1(25)	1(33.3)	4(20)
Amoxycylav	0	0	0	0
Piperacillin-tazobactam	9(69.2)	2(50)	1(33.3)	12(60)
Cefoxitin	9(69.2)	0	0	9(45)
Cefepime	8(61.5)	1(25)	0	9(45)
Ceftazidime	0	1(25)	0	1(5)
Ceftriaxone	4(30.8)	1(25)	0	5(25)
Clindamycin	8(61.5)	0	0	8(40)

DISCUSSION

In the present study among 180 pregnant women, the prevalence of UTI was found to be 43(23.9%). This is comparable to the previous studies.^{4,11} However much higher^{12,13} and lower^{14,15} prevalence of UTI in pregnant women was observed in few studies done in and outside India.

Asymptomatic pregnant women showed a high prevalence of UTI 38(88.4%). This is in agreement with previously done studies.^{11,13} On the contrary a study has reported a low prevalence of asymptomatic UTI.⁵ Pregnant women in the age group of 21-25 yrs 25(58.1%) showed a high prevalence of UTI. Another study has reported similar observations.⁶ The present study has found a higher prevalence of UTI among multigravida 24(55.8%). This is similar to studies conducted at other places.^{14,16} Highest prevalence of UTI among pregnant women was observed during the third trimester 18(41.9%). This finding is similar to other studies done in various places.^{16,17} However in the current study there was no statistically significant difference between various variables among pregnant women.

In the present study, gram-negative bacteria 22(51.2%) were isolated more commonly than gram-positive bacteria 20(46.5%). This is

comparable with previous studies.^{3,15} *E.coli* 14(32.6%) were the more frequently isolated organisms. Numerous studies have reported *E.coli* as the commonest causative agent of UTI in pregnancy.^{4,5,8}

In the present study, imipenem, amikacin, piperacillin-tazobactam, and nitrofurantoin were more sensitive antibiotics against both gram-negative and gram-positive bacteria causing UTI in pregnancy. Some of these antibiotics have been reported as most effective against uropathogens in few studies also.^{7,11,14} On the contrary, it was observed that amoxycylav, nalidixic acid, norfloxacin, ceftazidime, ceftriaxone were resistant to both gram-negative and gram-positive bacteria. A similar resistance pattern has been observed to some of these antibiotics in few studies.^{3,13,15}

Gentamicin, ciprofloxacin, ofloxacin, cotrimoxazole were found to be effective only against gram-negative bacteria. All the isolates in the present study were more resistant to commonly prescribed antibiotics like penicillin, oxacillin, azithromycin, erythromycin, norfloxacin, nalidixic acid, amoxycylav, cefepime, clindamycin, ceftriaxone, ceftazidime, cefoxitin.

CONCLUSION

Predominant presence of asymptomatic UTI in pregnancy and *E.coli* was the more frequently isolated organisms and bacterial resistance to commonly prescribed antibiotics was observed in the present study. This necessitates the screening of pregnant women in all trimesters of pregnancy irrespective of signs and symptoms of UTI for treatment by appropriate antibiotic therapy. This would prevent UTI associated maternal and neonatal complications and also the emergence of drug resistance leading to a better outcome of pregnancy.

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