

Original Research Article

Bacteriological Profile of Urinary Tract Infections among Pregnant Women (Clinically Suspected of Having UTIs) in a Tertiary Care Hospital

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ABSTRACT

Urinary tract infections (UTIs) are quite common during pregnancy because of the changes in the genitourinary tract induced by gestation. UTI in pregnancy is an important contributor to maternal and perinatal morbidity including pyelonephritis, cystitis, abortion, maternal anaemia, hypertension, preeclampsia, phlebitis, thrombosis and low birth weight.

With this background, the present study was planned and carried out in the department of Microbiology, Jorhat Medical College and Hospital- a tertiary care teaching hospital in Upper Assam with the objective to evaluate the existing scenario of UTIs in the pregnant women of the region. Urine samples were examined and cultured, uropathogens were isolated, identified and antimicrobial susceptibility was determined. The study group comprised of 85 pregnant women clinically suspected of having UTIs.

Results showed significant bacterial growth in 55.3 % of the total urine samples tested. Of these, 66.7% belonged to the age group of 25 to less than 35 years, 52 % in 15 to less than 25 years and 33.3 % was in 35 to less than 45 years of age. Maximum occurrences of UTIs were observed in the 3rd trimester (68.9 %), 47.8 % in the 2nd trimester and only 29.4% in the 1st trimester. Commonest uropathogen isolated was *Staphylococcus aureus* (34.7%), followed by *E. coli* (26.5%), *Enterococcus* (18.5%), *Klebsiella spp.* (12.2%), *Candida spp.*(4.1%), *Enterobacter* (2%) and *Coagulase negative Staphylococcus* (2%). *Staphylococcus aureus*, the commonest uropathogen isolated showed maximum sensitivity to Ceftriaxone and Norfloxacin (75.5% each). For the second most common uropathogen *E. coli*, Ciprofloxacin (84.6%) was found to be the most sensitive antibiotic, followed by Nitrofurantoin and Ceftriaxone (79.9% each). The present study observed increased resistance of both Gram +ve and -ve isolates towards older drugs like Ampicillin, Gentamicin and Cotrimoxazole. Thus an increasing trend in occurrence of UTI was observed as the gestational age advances.

Key words: Urinary tract infections (UTIs), Pregnancy, Uropathogens, Antimicrobial susceptibility.

INTRODUCTION

Urinary tract infections (UTIs) are among the most common bacterial infections during pregnancy. This is because of the morphological and physiological changes in the genitor urinary tract during gestation. [1,2] It is estimated that one in three women of child bearing age will have a UTI. [3]

Anatomically UTIs can be classified into lower and upper urinary tract infections. Lower UTIs involve the urinary bladder and the urethra. Kidney, pelvis and ureters are the target in upper UTI. Majority of the urinary tract infections occur due to ascending infections, [4] Common clinical manifestations of UTIs in pregnancy are

asymptomatic bacteriuria, acute cystitis and acute pyelonephritis. [5]

A urinary tract infection is defined as the presence of at least 1, 00000 organisms per milliliter of urine in an asymptomatic patient or as more than 100 organisms per milliliter of urine with accompanying pyuria (>5 WBCs /HPF) in a symptomatic patient. In case of an asymptomatic patient, a diagnosis of UTI should be supported by positive culture for a uropathogen. [6]

Pregnancy causes urethral dilatation, decrease in urethral tone and reduced urine concentration, leading to urinary stasis. This infect, is the single most important factor that can initiate proliferation of micro-organisms leading to increased susceptibility to UTIs in pregnant women. [7]

Urinary tract infections during pregnancy contribute significantly to maternal and perinatal morbidity. Abortions, low birth weight, maternal anaemia, hypertension, pre-eclampsia, preterm labour, phlebitis, thrombosis and chronic pyelonephritis are related to urinary tract infections during pregnancy. [8]

Keeping in view of this background, the present study was undertaken to determine the region specific (Upper Assam, India)

Prevalence of significant bacteriuria among pregnant women with clinical suspicion of UTI, isolation and identification of the microbial agents causing UTI during pregnancy and to find out the antimicrobial susceptibility pattern of the causative agents isolated.

MATERIALS AND METHODS

A cross sectional observational study was undertaken from September,2014 to August, 2015 in pregnant women, clinically suspected to be suffering from UTI attending antenatal OPD and those admitted in the indoor wards of Jorhat Medical College and Hospital, Jorhat. A total number of 85 cases were studied. Proper instructions regarding aseptic collections of

samples were briefed to all the subjects. Early morning clean catch mid stream urine samples were collected from every subject into a leak proof wide mouthed sterile screw- cap labeled container. Thereafter, samples were shifted to the bacteriology laboratory of the department of Microbiology of Jorhat Medical College and Hospital for necessary testings.

Microscopic Examination

Samples were processed within one hour of collection for microscopic examination. 10 ml of the urine from each sample was poured into a test tube and centrifuged at 2500 rpm for 5 minutes. Supernatant was discarded. A drop of residue was placed on a grease free glass slide and covered with a cover slip. Then the slides was examined under microscope at 40x magnification for pus cells, RBCs, epithelial cells, casts, crystal, yeast like cells etc. Pus cells >5/hpf were considered significant for infection.

Culture

Undertaking all statutory precautions, cultures were done by using calibrated bacteriological loop. For each sample, 0.001 ml of urine was cultured on a blood agar plate and Macconkey agar plate. After overnight incubation at 27° C for 24 hrs, the culture positive plates were examined. Colonies yielding bacterial growth of >10⁵ /ml were taken to be significant in the sample of symptomatic pregnant women.

Identification and susceptibility test

Identification of the bacterial pathogens was made by Gram stain, motility test, coagulase test and other routine biochemical reactions. Then the antibiotic susceptibility test was done for the isolates by standard Kirby-bauer disc diffusion method on Mueller Hinton agar plates following the National Committee of clinical laboratory standard (NCCLS) criteria. The panel of antibiotic tested against the isolates were; Ampicillin, Amoxy- clav, Nitrofurantoin, Norfloxacin, Cotrimoxazole, Ciprofloxacin, Gentamicin,

Amikacin and Ceftriaxone. Results interpreted according to CLSI guidelines.

Statistical analysis

Datas were entered and analyzed in Microsoft Excel, Chi-square test was done. P values less than 0.05 were considered statistically significant.

RESULTS

A total number of 85 urine samples of suspected UTI pregnant women were

tested, out of which 47 samples showed significant growth of pathogens. The overall prevalence of UTI among the clinically suspected cases is 55.3 %.

Table I: Prevalence of UTI (Urine culture positive) among clinically suspected pregnant women having UTIs

Total number of urine sample tested	Number of culture positive samples	Percentage of positive samples
85	47	55.3 %

Table 2: Age wise distribution of UTI (urine culture positive) among clinically suspected pregnant women having UTIs

Age group(years)	Total number of cases	Number of culture positive cases with significant growth	Percentage of positive cases
15 to < 25	50	26	52 %
25 to <35	30	20	66.7 %
35 to <45	3	01	33.3 %
≥ 45	2	00	-

UTI was maximum in the age group of 25 to < 35 years at 66.7 % followed by 15 to < 25 years (52 %) and 35 to <45 years (33.3%). In the age group of ≥45 years there was no positive case.

Statistically, the increased numbers of UTI occurring in the age group of 25 to <35 years is significant when compared with the next older group of 35 to <45 years, (P=0.041).

Table 3: UTI (urine culture positive) in relation to gestational age

Gestational Age(weeks)	Number of cases tested	Number of urine culture positive cases	Percentage of positive cases
1 to < 12	17	5	29.4 %
12 to <25	23	11	47.8 %
25-40	45	31	68.9 %

The highest occurrence of UTI was found in the third trimester (68.9%) followed by Second trimester (47.8%) and first trimester (29.4%).

This finding of maximum number of UTIs in the third trimester is statistically significant when compared with the less number of culture positive cases in the first trimester. (P=0.002)

Table 4: Distribution of isolated uropathogens

Uropathogens	Number of isolates N= 49	Percentage
Staphylococcus aureus	17	34.7 %
Enterococcus	9	18.4%
Coagulase negative staphylococcus(CONS)	1	2%
Escherichia Coli	13	26.5%
Klebsiella pneumoniae	6	12.2%
Enterobacter	1	2%
Candida species	2	4.1%

Even though statistically not significant, the commonest uropathogen isolated was *Staphylococcus aureus* with

34.7%. Then came *E. coli* (26.5%) and *Enterococcus* (18.4%).

Table 5: Antibiogram of isolated Gram positive bacteria

Antibiotics tested	Staphylococcus aureus (n= 17)		Enterococcus (n = 9)	
	S (%)	R (%)	S (%)	R (%)
Ampicillin	10 (58.8%)	7 (41.2%)	5 (55.6%)	4 (44.4%)
Amoxy/clav	12 (70.6%)	5 (29.4%)	6 (66.7%)	3 (33.3%)
Nitrofurantoin	10 (58.8%)	7 (41.2%)	4 (44.4%)	5 (55.6%)
Norfloxacin	13 (76.5%)	4 (23.5%)	2 (22.2%)	7 (77.8%)
Cotrimoxazole	7 (41.2%)	10 (58.8%)	5 (55.6%)	4 (44.4%)
Ciprofloxacin	11 (64.7%)	6 (35.3%)	8 (88.9%)	1 (11.1%)
Gentamicin	5 (29.4%)	12 (70.6%)	6 (66.7%)	3 (33.3%)
Amikacin	10 (58.8%)	7 (41.2%)	7 (77.8%)	2 (22.2%)
Ceftriaxone	13 (76.5%)	4 (23.5%)	8 (88.9%)	1 (11.1%)

Of the total 17 number of *Staphylococcus aureus* isolates, maximum sensitivity was shown to Norfloxacin and Ceftriaxone, both 13 isolates each (76.5%) followed by Amoxy/clav- 12 (70.6%), Ciprofloxacin 11 (64.7%), Ampicillin, Nitrofurantoin, Amikacin- 10 each (58.8%) and Cotrimoxazole-7 (41.2%).

The total of *Enterococci* isolates numbered 9. The maximum sensitivity was showed to Ciprofloxacin and Ceftriaxone- each 8 (88.9%) followed by Amikacin-7 (77.8%), Amoxy/clav, Gentamicin-each 6 (66.7%); Ampicillin, Cotrimoxazole-each 5 (55.6%); Nitrofurantoin, Norfloxacin-each 2 (22.2%).

Table 6: Antibiogram of isolated Gram Negative bacteria

Antibiotics tested	Escherichia coli (N= 13)		Klebsiella pneumoniae (N= 6)	
	S %	R %	S %	R %
Ampicillin	4 (30.8%)	9 (69.2%)	2 (33.3%)	4 (66.7%)
Amoxy/clav	9 (69.2%)	4 (30.8%)	5 (83.3%)	1 (16.7%)
Nitrofurantoin	10 (76.9%)	3 (23.1%)	2 (33.3%)	4 (66.7%)
Norfloxacin	8 (61.5%)	5 (30.5%)	6 (100%)	0 (0%)
Cotrimoxazole	4 (30.8%)	9 (69.2%)	2 (33.3%)	4 (66.7%)
Ciprofloxacin	11 (84.6%)	2 (15.4%)	3 (50%)	3 (50%)
Gentamicin	8 (61.5%)	5 (30.5%)	4 (66.7%)	2 (33.3%)
Amikacin	5 (30.5%)	8 (61.5%)	3 (50%)	3 (50%)
Ceftriaxone	10 (76.9%)	3 (23.1%)	5 (83.3%)	1 (16.7%)

Of all the 13 *E. coli* isolates, 11 (84.6%) showed maximum sensitivity to Ciprofloxacin, followed by Nitrofurantoin and Gentamicin-8 (61.5%) each. Amikacin, Ampicillin and Cotrimoxazole showed sensitivity in 5 (38.5%), 4 (30.8%), 4 (30.8%) isolates respectively.

The sensitivity of *Klebsiella pneumoniae* was maximum to Norfloxacin (100%), followed by Amoxy/clav and Ceftriaxone (83.3%); Gentamicin, Ciprofloxacin and Amikacin (50%) each; Ampicillin, Nitrofurantoin and Cotrimoxazole (33.3 % each).

DISCUSSION

The present study showed significant bacterial growth in more than half (55.3%) of the total urine samples from pregnant women with clinically suspected UTIs. This finding is higher than what was obtained by Nithyalakshmi et al. [9]

Our study found highest number of positive cultures in the samples from the age group of 25 -- <35 years (66.7%), followed by 15 --<25 years (52%) and 33.3% in 35-45 years age groups. A similar pattern was also observed in various other studies. [9,10] Pregnant women of the age group of 25 -- <35 years are likely to be multiparous and sexually more active. It is well known that multiparity is itself is a risk factor for significant bacteriuria during pregnancy. [9] Moreover, sexual activity is considered to increase the risk of UTIs in the pregnant women of this age group. [11-13] UTIs occur more frequently in sexually active females during pregnancy because of the anatomical relationship of the urethra and vagina. [14,15]

In our study, highest occurrence of UTI was found in the 3rd trimester (68.9%), followed by 2nd trimester (47.8%) and was least in the first trimester (6.7%). Similar observations were also made in other

studies. [11,13] Pregnancy induces progressive changes in the genitourinary system inducing urethral dilatation, decreased urethral tone and reduced urinary concentration leading to stasis of urine. All these factors contribute towards risk of UTIs in pregnancy which increases with duration of gestation.

The commonest uropathogen isolated in our study was *Staphylococcus aureus* (34.7%). *E. coli* claimed the second spot with 26.5%, followed by *Enterococcus* (18.4%). These findings are different from the observations made in other studies where *E. coli* was the commonest uropathogen. [9,11,16-18] Thus we could see that there is a region based species variation of the predominant uropathogens isolated in UTIs during pregnancy.

Staphylococcus aureus, the common uropathogen isolated in our study showed maximum sensitivity to Norfloxacin and Ceftriaxone (75.5% each) followed by Amoxy/clav (70.6%) and Ciprofloxacin (67.7%). For the second most common pathogen, *E. coli*, Ciprofloxacin (84.6%) was the antibiotic to which maximum sensitivity was noticed followed by Nitrofurantoin and Ceftriaxone (79.9% each). The third commonest isolate of *Enterococci* were most sensitive to Ceftriaxone and Ciprofloxacin (88.9% each) followed by Amikacin (77.8%). *Klebsiella species*, the fourth most frequently obtained isolate showed maximum sensitivity to Norfloxacin (100%) followed by Amoxy/clav and Ceftriaxone (83.3% each). In our study, the average sensitivity to Ceftriaxone was found to be 82.7% in Gram positive isolates and 81.7% among the gram negative isolates. Nithyalakshmi J et al also reported a similar observation with 88.5% sensitivity to Ceftriaxone in gram negative isolates. Further, the present study observed increased resistance of both gram positive and gram negative isolates towards older antibiotics like Ampicillin and Gentamicin compared to newer antibiotics (like Ceftriaxone).

CONCLUSION

Physiological and anatomical changes in the genitourinary tract predispose women to urinary tract infections during pregnancy. Occurrences of UTIs in pregnancy are also related to factors such as age of the women, gestational age, sexual activity and number of pregnancies. In order to prevent UTIs in pregnancy, few recommendations conceived in light of the present study are presented below:

1. Pregnant women should be screened routinely for UTIs-preferably during every antenatal visit.
2. Every pregnant woman should be made aware of UTIs during pregnancy and adequately apprised of the precautions to avoid UTIs. Care regarding maintenance of personal hygiene should be specifically stressed.
3. Significant cases of bacteriuria should be properly evaluated and treated with appropriate antibiotics.

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