

Microbiology of Urinary Tract Infection and the Status of Urinary Isolates in Pregnant Women

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ABSTRACT

Introduction: Urinary tract infection (UTI) is one of the most frequently encountered problems owing to significant number of patients needing hospitalization during pregnancy. The incidence of UTI in pregnant women is reported to be high up to 7-8%.

Methods: This is a prospective study conducted in Valley Maternity Hospital during a period of 6 months (Jan 2011 to June 2011). 520 MSU (Mid stream urine samples) from pregnant women clinically suspected of urine infection were evaluated by urine dipstick analysis, microscopic and culture method. The isolates were identified and antibiotic sensitivity pattern was determined by standard protocol.

Results: The majority of the patients were in-between the age group of 20-30years- 338cases (65%) and these patients usually presented in the first trimester of pregnancy- 317cases (60.96%). Out of the 520 clinically suspected UTI cases, 232 (44.61%) was culture positive. Out of the culture positive cases; Escherichia coli (E.coli) was the most common accounting for a total of 144cases (80%). Nitrofurantoin was found to be the most effective drug against the gram negative (Gm-ve) bacteria. Similarly, Ampicillin, Amoxycillin and Cloxacillin were found to be effective agent against gram positive (Gm+ve) bacteria.

Conclusions: Screening for bacteriuria is recommended among all pregnant women at the first prenatal visit and in the subsequent trimesters of pregnancy. Prompt treatment of symptomatic UTI and asymptomatic bacteriuria is required in pregnant women to avoid complications like preterm birth, low birth weight and increased perinatal mortality.

Keywords: UTI; pregnant women; antibiotics; culture method.

INTRODUCTION

Urinary tract infection (UTI) is one of the most frequently encountered problems owing to significant number of patients needing hospitalization during pregnancy. The incidence of UTI in pregnant women is reported to be high up to 7-8%¹.

The frequency of asymptomatic bacteriuria occurs in 2-7% of pregnancies, similar to the non-pregnant population. However, upto 40% of these may progress to symptomatic upper tract UTI or pyelonephritis, significantly more in pregnant women^{1,2}.

2% of 24000 patients acquire acute pyelonephritis during pregnancy. UTI is associated with risks to both the fetus and mother including pyelonephritis, preterm birth, low birth weight and increased perinatal mortality³.

Several physiologic changes during pregnancy cause otherwise healthy women to be more susceptible to serious sequelae from urinary tract infections. The infections can be symptomatic or asymptomatic. Treatment of asymptomatic bacteriuria reduces the risk of a symptomatic infection^{4,5}.

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Presentation varies depending on whether the patient has asymptomatic bacteriuria, a lower tract UTI (cystitis) and an upper tract UTI (pyelonephritis). Burning with urination (dysuria) is the most significant symptom in pregnant women with symptomatic cystitis. Symptoms of pyelonephritis include: fever associated with chills, nausea and vomiting, costovertebral angle (CVA) or flank pain^{6,7}.

E. coli is the most common cause of UTI, accounting for 80-90% of cases. It originates from fecal flora that colonise the periurethral area (ascending infection)^{8,9}. Klebsiella, Enterobacter and Proteus species cause most of the remaining cases. Gram positive organisms, particularly Enterococcus faecalis and group B streptococcus are also clinically important pathogens^{10,11}.

This article deals with the frequency of UTI in pregnant women, efficacy of detecting UTI by culture, significance of pus cells, etiological agents for UTI in pregnant women and their antibiotic sensitivity patterns.

METHODS

This is a prospective study conducted in Valley maternity hospital from Jan 2011- June 2011 (6 months). Verbal consent was taken to all the patients for fulfilling semi-structured interview questionnaire.

Purposive sample were selected on the basis of symptoms of increased frequency of micturition, dysuria, urgency and fever in clinically suspected UTI patients. All clinically suspected pregnant women of UTI, attending out patients department (OPD) and hospitalized were included whereas non-pregnant women were excluded.

520 MSU specimens were received in the lab. All specimens were investigated by conventional semi-quantitative culture technique, pus cell count, RBC count, and epithelial cell count and albumin test. For culture, 0.001 ml of uncentrifused mixed MSU specimens, were streaked onto Mac- Conkey agar and Blood agar plates with the help of standard flame sterilized loop. Bacterial growths were observed following overnight incubation and their sensitivity pattern were determined by Kirby-Bauer disc diffusion method.

RESULTS

Out of 520 clinically suspected pregnant women, the majority of the patients were in-between the age group of 20-30years, 338cases (65%).

Out of the 520 clinically suspected UTI cases, 232 (44.61%) was culture positive. The highest incidence of culture positivity was found to be 60.54% in the age group of 20-30 years.

Table 1: Age-wise distribution of cases along with culture positivity

Age of patient	<20 years	20-30 years	>30 years
Total suspected cases (N=520)	150 (28.84%)	338 (65%)	32(5.67%)
Total culture positive cases (232= 44.61 %)	73 (31.29%)	140 (60.54%)	19 (8.16%)

Table 2. Cases of UTI according to the trimester of pregnancy

Trimester	First	Second	Third
Total cases (N=520)	317 (60.96%)	37 (7.11%)	166 (31.92%)

The majority of the patients presented in the first trimester of pregnancy- 317cases

(60.96%) followed by third trimester of pregnancy- 166cases (31.92%).

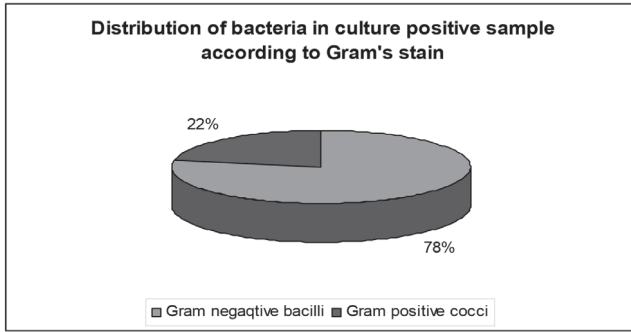
Table 3. Showing relationship of cases with pus cells and positive culture results

Pus cells/HPF	Total suspected cases (%)	Culture positive cases (%)
0	8 (1.5%)	0 (0%)
0-1	197 (37.88%)	29 (14.72%)
1-5	240 (46.15%)	128 (53.33%)
5-10	75 (14.42%)	75 (100%)

Out of the total suspected cases; 53.33% were urine culture positives and had pus cell counts (1-5/hpf)

However, cases which have more than 5 pus cells/ hpf were all culture positives.

Figure 1. Gram stain frequency.



Out of the 132 culture positive cases, the most common organism isolated was Gram negative bacilli- 180 cases (78%) followed by Gram positive cocci- 52 cases (22%)

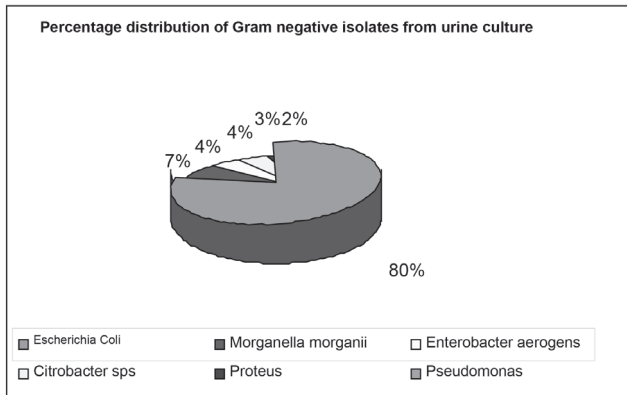


Figure 2. Distribution of gram negative isolates. Out of the Gram negative isolates, Escherichia coli were found to be the most common accounting for a total of 144 cases (80%).

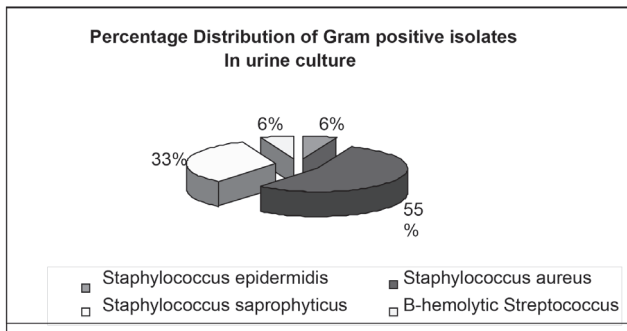
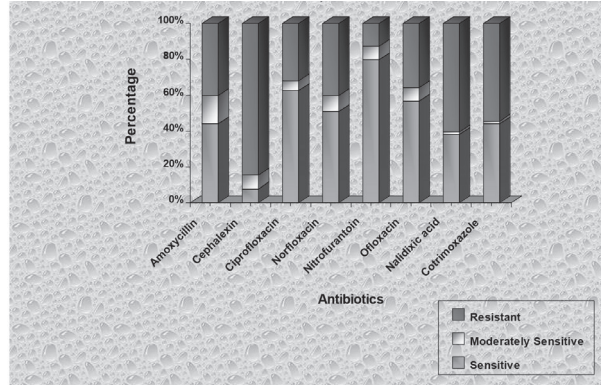


Figure 3. Distribution of gram positive isolates.

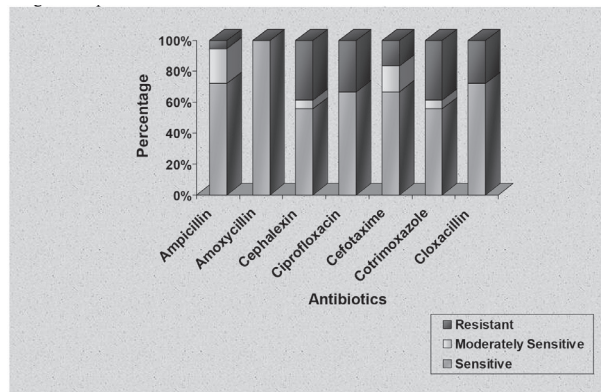
Amongst the Gm positive isolates, Staphylococcus aureus was the commonest accounting for a total of 29 cases (55%).

Figure 4. Antibiotic sensitivity pattern of Gram negative bacteria from urine sample



Nitrofurantoin was the most sensitive drug isolated with a sensitivity of 80%. The least sensitive drug was cephalosixin.

Figure 5. Antibiotic sensitivity pattern of Gram positive bacteria from urine sample



Amoxycillin, Ampicillin and cloxacillin were the sensitive drugs isolated against the Gm positive organisms.

DISCUSSION

UTI is very common during pregnancy. The majority of the patients in the present study were in-between the age group of 20-30years- 338cases (65%). This correlates well with a study conducted by Subedi M et al who showed the similar incidence as 61%.¹² This is explained by the fact that the highest incidence of pregnancy in Nepalese women is usually between 20-30years.

Vaginal infections can cause or mimic UTI, which are common in women of reproductive age, affecting 25-35% of women aged 20-40 years.¹³

The majority of the patients in our study presented in the first trimester of pregnancy- 317cases (60.96%) followed by third trimester of pregnancy- 166cases (31.92%). This can be explained by the fact that all pregnant women in their first presentation are thoroughly screened with investigation measures including hematological profile, biochemical profile, viral markers and urine examination. This helps in detecting asymptomatic bacteriuria in the first trimester of pregnancy.¹⁴

Out of the total suspected cases; 53.33% were urine culture positives and had pus cell counts (1-5/hpf). However, cases which have more than 5 pus cells/hpf were all culture positives. This correlated with the study conducted by Subedi M et al who also showed 81.3% positive culture isolates in patients who had pus cell count (1-5/ hpf) and 100% culture positivity in patients with more than 5 pus cells/ hpf.¹²

In the present study, out of the 520 clinically suspected UTI cases, 232 (44.61%) was culture positive. Similar incidence is observed in a study conducted by Subedi M and Basnyat SR, which showed the percentage of culture positives as 45%.¹² Out of the culture positive cases; E.coli was the most common accounting for a total of 144cases (80%). Similarly, Staphylococcus aureus was the most common amongst the Gram positive organisms- 29cases (55%). Nitrofurantoin was found to be the most effective drug against the Gram negative bacteria with a sensitivity of 80%. Ampicillin, Amoxycillin and Cloxacillin were found to be the effective agents against Gram positive bacteria. Subedi M and Basnyat SR in their study found Amikacin as the most effective antibiotic against Gram negative organisms with a sensitivity of 64.4% followed by ciprofloxacin and Nitrofurantoin.¹²

E.coli is the most common cause of UTI, accounting for 80-90% of cases. It originates from the fecal flora that colonizes the periurethral area (ascending infection). A study conducted by Santosh JF et al. has also stated that the microorganism frequently isolated associated with first infection of UTI has always been and is coliform bacilli followed by Staphylococcus species.^{12,15,16} Similar type of result was found by Latham et al with 60% of infection by E.coli, 30% by Staphylococcus saprophyticus and 10% by Proteus mirabilis. Similarly, Pandey has shown a reduced incidence of E.coli (35.4%) followed by Coagulase

positive staphylococcus- COPS (22.3%) and Coagulase negative staphylococcus- CONS (Saprophyticus) -18.8%. Equal percentage of Enterobacter species and Klebsiella were also isolated, 2.1% each. He also stated that the microorganism frequently isolated with first infection of UTI has always been coliform bacilli followed by staphylococcus species.^{17, 18}

Hormonal and mechanical changes increase the risk of urinary stasis and vesico-ureteric reflux. These changes along with an already short urethra and difficulty with hygiene due to distended belly increase the frequency of UTI in pregnant women.⁹

Similarly, the untreated infections are associated with low birth weight, prematurity, premature labour, hypertension, pre-eclampsia and amnionitis. A retrospective population based study by Mazor-Dray et al showed that urinary tract infection during pregnancy is independently associated with intrauterine growth restriction, pre-eclampsia, preterm delivery and even caesarian section.¹⁹

Similar study conducted by Mohammed V Rabat during a period of 18months in the military hospital, Morocco had found that out of the 147 patients, 45 had features of UTI. 19 patients had acute pyelonephritis (28.9%). Out of the 58 patients with uncontrolled Diabetes Mellitus, 13 had UTI and five had risk of premature labour.²⁰

Women with risk factors have the additional risks of a first, recurrent or persistent UTI. These women should undergo more frequent screenings. Risk factors include DM, including gestational diabetes, urologic abnormalities (eg. Neurogenic bladder, duplicated collecting systems), pre-pregnancy and antepartum history of UTI prior to initiation of prenatal care and sickle cell haemoglobinopathies.²⁰

CONCLUSIONS

Screening for bacteriuria is recommended among all pregnant women at the first prenatal visit and in the subsequent trimesters of pregnancy. The most effective method is urinalysis followed by culture. In the presence of risk factors for UTI, it is recommended to do urinalysis every month.

Untreated UTI can lead to complications such as pyelonephritis, low birth weight infants, premature delivery and occasional still birth. Therefore, prompt treatment of symptomatic UTI and asymptomatic bacteriuria is required in pregnant women.

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