

## Original Research Article

# Antibiotic Sensitivity Pattern of Uropathogens: A Comparative Study between Symptomatic and Asymptomatic Bacteriuria in Pregnant Women

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## ABSTRACT

Urinary Tract Infections is one of the most common infections observed in clinical practice especially in pregnant women. This study was conducted on 2445 pregnant women to identify the prevalence of symptomatic and asymptomatic UTI, their bacterial profile and antibiogram. A total of 491 pregnant women had significant bacteriuria and 59% of them were symptomatic while 40 % were asymptomatic. E. coli was the predominant organism sensitive to mainly aminoglycosides like Gentamicin, Amikacin, Nitrofurantoin Amoxycylav, . Increasing resistant pattern was observed for Cephalosporins, Ampicillin. The UTI was more prevalent in the third trimester in the patients rather than in the first and second. All the women were also tested for blood glucose levels and 45 of the 491 women were positive for gestational diabetes. But there was no significant difference in the type of bacteria in gestational diabetes mellitus. Neither was there any difference in the symptomatic or asymptomatic bacteriuria among GDM. As untreated cases of UTI in pregnant women may result in severe mortality in the mother and child, it is imperative to diagnose and treat it as early as possible.

### Keywords

Uropathogens, Symptomatic and Asymptomatic Bacteriuria, and Pregnant Women

## Introduction

One of the most common infections observed in clinical practice is Urinary Tract Infections infecting about 10% of the patients visiting a hospital (Taslina Taher Lina et al., 2007). Urinary Tract Infection (UTI) is due to the proliferation of bacteria anywhere in the urinary tract. These bacteria may arise from the digestive tract and enter the opening of the urethra to multiply and

cause infection. (Rahimkhani M et al., 2008 and Okonko IO et al., 2009).

Women are especially prone to UTI because of their anatomical position. Unlike men, the women have a shorter urethra, absence of prostatic secretions, pregnancy, and easy contamination with fecal flora (Haider G et al., 2004).

In pregnant women, UTI is a common health hazard. It usually begins to occur in early pregnancy at 6 weeks and peaks during 22 to 24 weeks due to number of factors including ureteral dilatation, increased bladder volume and decreased bladder tone, along with decreased ureteral tone which contributes to increased urinary stasis and ureterovesical reflux. (Chaliha et al., 2002).

Up to 70% of pregnant women develop glycosuria, which encourages bacterial growth in the urine. (Al-Issa et al., 2009)) and may lead to Gestational Diabetes Mellitus (GDM). During pregnancy, UTI may also cause anemia, hypertension, chronic renal failure, pyelonephritis premature delivery and fetal mortality (Lawani Ebidor et al).

Gestational diabetes is high blood glucose occurring exclusively in pregnant women who did not previously have diabetes. About 5% of pregnant women develop gestational diabetes. It usually occurs around the 24th week of pregnancy, when the body produces large amounts of hormones to help the baby grow. These hormones cause insulin resistance and unless the woman can produce more insulin to overcome the resistance, the blood glucose will rise. High blood glucose levels may cause the baby to grow large (Bayer Diagnostics)

Although only a temporary disease seen only during pregnancy it is equally, if not more dangerous than any other kind of diabetes.

The prevalence of UTI in GDM and its complications in comparison to the women without GDM has not been properly studied. In a review of literature between 1965 and 1985, 4% prevalence of acute pyelonephritis was observed in women with GDM and compared with 2% in women without GDM. There have been very few reports of

increase in prevalence of UTI among GDM in comparison to non GDM (Rizk DEE., 2001).

It is imperative to investigate epidemiology of urinary tract infections especially in pregnant women so that necessary interventions can be taken to prevent morbidity to mother and child.

More so if the mother is suffering with diabetes mellitus. With this in view, we performed this study to identify the prevalence of in UTI in pregnant women with DM and the bacterial profile and antibiogram.

## **Materials and Methods**

A total of 2445 pregnant women were studied in a period of 3 years from March 2012 – March 2015 in the department of Gynaecology, M N R Medical College, sangareddy and King Koti Hospital, APVVP, Hyderabad.

Blood for Glucose levels and Mid Stream Urine for culture and sensitivity was collected from all the patients. Symptoms for significant bacteruria were noted.

The urine was transported to the Microbiology Department for culture and sensitivity. All the urine samples were inoculated onto Mac Conkey's Agar, Blood Agar and Urichrome Agar. All the positive isolates were identifies by biochemical reactions as per CLSI guidelines. Significant bacteruria of  $>10^5$  colonies was taken into consideration

These were further subjected to Antibiotic sensitivity testing on Mueller Hinton Agar using Amoxycillin, Nitrofurantoin, Cotrimoxazole, Amikacin, Ciprofloxacin, Cefotaxime, Vancomycin, Methicillin,

Penicillin by Kirby Bauer's disk diffusion method, as per CLSI guidelines..

## Results and Discussion

Of the 2445 samples, significant bacteriuria ( $>10^5$  cfu/ml) was seen in 491(20.1%) patients. Of these, 293 (59.7%) had symptoms while 198(40.3%) were asymptomatic (Fig: 1).

Diabetes mellitus was observed among 45 women all in the third trimester of pregnancy. As they did not have a history of previous diabetes, they were all considered to be Gestational Diabetic mellitus(GDM). 24 of the GDM were symptomatic to UTI while 21 were asymptomatic (Table: 1)

Mixed growth i.e. more than one organism was seen in 3 cases. All the others had single isolates grown. The most common organism found was *Escherichia coli* (47.5%) followed by *Klebsiella* spp (18.1%), *Enterococcus* (10.8%), *Staphylococcus aureus* (6.9%), CONS (6.3%), *Psuedomonas* (4.7%), *Enterobacter* (4.3%), *Proteus mirabilis* (1.4%) (table 2).

Of the drugs tested, high sensitivity pattern was seen towards Amikacin (95%), Gentamicin (87%), Nitrofurantoin (87%), Ciprofloxacin (91%), Cefotaxime (72%). Increase resistant pattern was observed in Ampicillin (73%), first generation cephalosporins like Cefozolin (89%), Cefoxitin (82%). Among the Gram Positive Cocci, Sensitivity was seen more for Clindamycin (97%), Vancomycin (100%), Oxacillin (89%) (table3)

UTI occurs at any age and in any sex, but more so in pregnant women, probably due to physiological and hormonal changes. After 6<sup>th</sup> week of gestation, the uterus dilates resulting in production of progesterone and estrogen which lowers the tone of the uterus.

Increased plasma volume in pregnancy leads to concentration of urine and increase in bladder volume. All this leads to urinary stasis and uretero vesicle reflex (Delzell JE et al., 2000).

In our study the prevalence of Urinary tract infections in pregnant women was 20.1% which was very similar to the study by Lawani Ebidor et al, who showed a prevalence of 25% (Lawani Ebidor et al., 2000) and Akinloye et al who reported 21.7% (Akinloye O et al., 2006). However in other studies, higher prevalence were reported, like Onuh et al (32.7%) (Onun SO et al., 2006), 45.7% by Okonko et al (Okonko et al., 2009). Lesser rate of incidences were found in few other studies . Tazebew et al reported a prevalence of 9.5% (Tazebew et al., 2012), while 14% was reported by Hamdan et al (Hamdan Z et al., 2011)and 10.4 % by Alemu et al (Alemu et al. 2012)

Of the culture positive patients 40.3% were asymptomatic which is almost half of the patients with significant bacteriuria. Many other studies showed a very low prevalence of significant bacteriuria in asymptomatic cases with 10.6% by Aseefa et al, 18.9% by Tazebew et al, 14.7% by Hamdan et al. .

In our study, of these culture positive cases 45 patients had Diabetes mellitus. Of these patients, 8.2% were symptomatic while 10.6% were asymptomatic. Not many studies have been performed in this field but in a study by Rizk et al 4.2% of women with GDM showed significant bacteriuria (Rizk DEE et al., 2001). They also concluded in their study GDM was not a risk factor for Urinary Tract Infections. *E. coli* was the predominant organism accounting for 41.7% cases. This was followed by *Klebsiella* spp in our study, followed by *Staph. aureus*, CONS and *Enterococcus*.

**Table.1** GDM in Symptomatic and Asymptomatic patients

Total samples with growth = 491	Symptomatic 293	Asymptomatic 198
Presence of GDM	24 (8.2%)	21 (10.6%)
Non presence of GDM	269 (91.8%)	177 (89.4%)

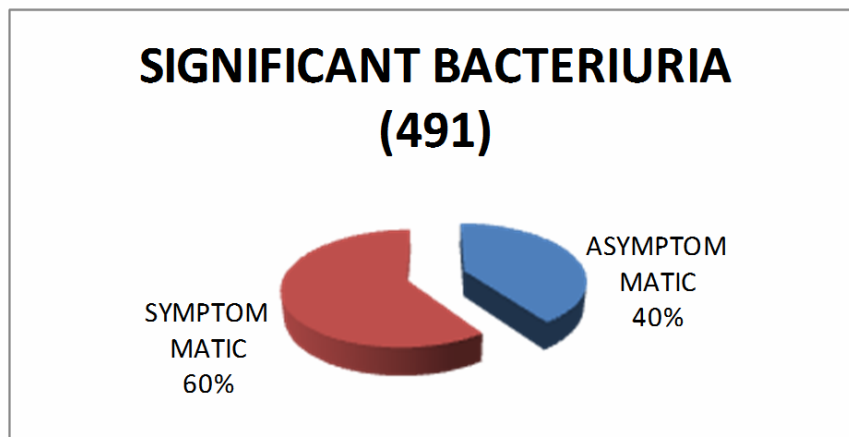
**Table.2** Number of different isolated organisms

ORGANISM	NUMBER	PERCENTAGE
E.COLI	233	47.5%
KLEBSIELLA SPP	89	18.1%
ENETROCOCCUS	53	10.8%
STAPH AUREUS	34	6.9%
CONS	31	6.3%
PSEUDOMONAS	23	4.7%
ENTEROBACTER	21	4.3%
PROTEUS MIRABILIS	7	1.4%

**Table.3** Antibiotic Sensitivity of isolated organisms

ORGANISM	AMIKACIN	GENTAMICIN	CIPROFLOXACIN	CEFOTAXIME	CEFAZOLIN	AMPICILLIN	NITROFURANTOIN	COTRIMOXAZOLE
E.COLI (233)	221	203	212	168	26	63	203	45
KLEBSIELLA SPP (89)	81	73	77	61	13	13	82	18
PSEUDOMONAS (23)	22	19	22	11	8	7	22	13
ENTEROBACTER (21)	21	21	21	17	13	15	21	9
P. MIRABILIS (7)	7	7	6	5	2	2	7	7

**Fig.1** Symptomatic and asymptomatic patients in significant bacteriuria



But Aseefa et al found Staph aureus to be the predominant organism next to E. coli, Tazebew et al found CONS to be the second most prevalent after E. coli. Mario Bonadio reported E.coli (56%) to be the most common organism followed by Enterococcus (7%), Pseudomonas (4%) in Diabetic patients. They found no difference in the bacterial profile in diabetic and non diabetic patients (Mario Bonadio et al., 2002). Lawani et al reported E. coli to be the prevalent organism (40%) which is in consistant with other studies by, Rahman et al, Ahmed t al, Okonko etal, Musbau et al.

Although Carbapenems are not used in pregnant women, it was found to be the most sensitive to all the Gram Negative Bacilli with all of them being sensitive,

Amongst others, high sensitivity in our study was found to be to Ciprofloxacin, Gentamicin, Nitrofurantoin, Ofloxacin and Amikacin. For Gram positive Cocci, high sensitivity pattern was seen in Amoxyclav, Nitrofurantoin,

Increasing resistance pattern were seen to Cephalosporins and Ampicillin. Similar pattern was seen by other researchers with Nitrofurantoin, Gentamicin and Kanamycin being the most sensitive for Gram Negative Bacilli and Amoxyclav, Nitrofurantoin, Clindamycin, Vancomycin, Oxacillin for Gram Positive Cocci. This was similar to studies by Sabrina J Moyo et al., Gupta *et al.*, Arredondo-Garcia *et al.*; Arredondo-Garcia & Amabile-Cuevas.

The increasing resistance to cephalosporins may be due to the production of Extended Spectrum Beta Lactamases by the organism.

In our study, we found that UTI was more common among the women in their third

trimester rather than the first and second. The same was observed by Lawani et al, Leigh and Sharma, and Okonko et al.

This study shows a high prevalence of asymptomatic bacteriuria among pregnant women irrespective the gestational stage or their age. The incidence was higher in the third semester rather than first or second. E. coli was found to be the most prevalent organism and highly sensitive to quinolones, nitrofurantoin and Aminoglycosides.

As the untreated cases may lead to high morbidity including preeclampsia in the mother and baby, it becomes necessary to identify the UTI and treat immediately. This can be done with regular screening of urine in the pregnant women especially in the third trimester, whether or not the patient has diabetes mellitus or symptoms of bacteriuria.

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