

## Bacteriological profile and anti-biogram pattern of asymptomatic UTI in pregnant Women at Tertiary Care Teaching Hospital, Vadodara, Gujarat

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### Abstract

**Background and Aims:** Urinary tract infection in pregnancy has higher rate of morbidity for both mother and baby. Asymptomatic bacteriuria occurring in 2-12% of pregnancy is mainly responsible for the occurrence of Pyelonephritis which occur with complication, such as premature labour and Low birth weight baby. Aim of study was to decide bacteriological profile and antibiotic sensitivity patterns of urinary isolates from pregnant women.

**Material and Methods:** A total of 501 pregnant women without symptoms of Urinary tract infection, attending antenatal OPD at S.S.G. Hospital and Medical College Baroda from April 2005 to March 2006, were enrolled in our study. Organisms were identified from Midstream urine specimen and antibiotic susceptibility test was performed using bacteriological standard tests. Data were collected using predesigned performa.

**Results:** Out of 501 pregnant women 60 (11.97%) were culture positive. Multiparous women had highest percentage of culture positivity of 26.92%. Staph. aureus was the predominant organism isolated (in 23 out of 60 cases) and E.coli was 2<sup>nd</sup> most common organism isolated (in 21 out of 60 cases). There were also Pseudomonas Spp., Streptococcus Spp., Proteus mirabilis, Acinetobacter Spp., Enterococcus Spp., Klebsiella Spp., and Candida Spp. The organisms were sensitive to Cefotaxime, Ciprofloxacin, Nitrofurantoin, Gentamicin, Cephalixin and Nalidixic acid in decreasing order. Gram positive organism and gram negative bacteria showed high sensitivity against Cefotaxime, Ciprofloxacin and Nitrofurantoin with a rate of 66.15%, 64.61% & 63.07% respectively.

**Conclusion:** In present study, the isolated organisms from suspected pregnant women were resistance to the routinely used antibiotics. Therefore, it requires screening of all the pregnant women to urinary tract infection and treat those infected with appropriate antimicrobial regimens in order to reduce its complication.

**Key words:** Bacterial profile, Antibiotic resistance, Asymptomatic bacteriuria, Pregnancy.

### Introduction

The urinary tract infections (UTI) are the commonly associated with pregnancy. Asymptomatic UTI develops in 2-12% of pregnancy and it's a major predisposition to the development of pyelonephritis associated with complications like preterm labour and low birth weight baby<sup>(1,5,6,9,10,11)</sup>. In asymptomatic bacteriuria (ASB) there is presence of minimum 10<sup>5</sup> colony forming units (CFU) per ml of urine, of a single uro-pathogen in a midstream urine without symptoms and signs such as dysuria, frequency of micturition, fever, loin pains, renal angle tenderness, suprapubic pain and tenderness.<sup>(2,5,10,11)</sup>

Urinary tract infection (UTI) is commonly due to organism from the gastro-intestinal tract which moves towards the urethra and multiply to cause UTI<sup>(1)</sup>. UTI developed 2–10 times higher in pregnant than in the non-pregnant ladies<sup>(3)</sup>. Women are more susceptible to UTI as compare to man due to shorter urethra, pregnancy and close proximity of the urethral orifice to the anus<sup>(1,2,3)</sup>.

In pregnancy, significant changes in the urinary tract occurs due to hormonal & mechanical changes includes reduced ability of kidneys to adequately concentrate urine, leading to differences in the pH and osmolarity of urine in pregnancy; stasis of urine due to smooth muscle relaxation, decrease in ureteric

peristalsis. The physiological increase in plasma volume during pregnancy, decrease urine concentration leading to decreased ability of the lower urinary tract to resist invading organisms<sup>(1,2,3,6,7,8,9,10)</sup>. In addition, a number of conditions like low socio economic status, multi-parity, illiteracy, medical disorders like diabetes mellitus & sickle trait are also associated with increased cases of asymptomatic bacteriuria during pregnancy. All these factors increases risk of UTI in pregnant women.<sup>(1,3,4,5,6,9,11)</sup>

Pregnancy is a provocation for the asymptomatic to become symptomatic. About 10%-25% of those with asymptomatic bacteriuria develop symptomatic bacteriuria during pregnancy<sup>(4,8)</sup>.

Complications associated with Asymptomatic bacteriuria are preterm labour, low birth weight infants, intrauterine growth retardation, fetal death, pregnancy induced hypertension(PIH)etc. It requires screening of all pregnant mothers for urinary tract infection during the first antenatal visit<sup>(2,3,4,5,7,8,9,10,11,12)</sup>. Bacteriuria may remain alive after delivery and may result into chronic infections<sup>(2,3,4,5,7,8,12)</sup>.

Organisms that causing UTI are those from the vaginal, perineal, fecal flora and gastro-intestinal tract. They include *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas species*, *Proteus mirabilis*, *Klebsiella*

species, and *Streptococcus* species amongst others<sup>(3,4,5,9,12,13)</sup>.

The microbial profile of UTI has never been constant, keep changing with variations in the geographical location, so it is always better to know the organisms responsible for UTI. In developing countries, especially in low resource settings to prevent or reduce maternal and fetal morbidities antibiotics are usually given empirically before the urine culture reports are available. To ensure appropriate therapy, current knowledge of the organism that causes the UTIs and their anti-biogram pattern is mandatory<sup>(3,11)</sup>. The aim of this study is therefore to determine the prevalence of UTI in pregnancy and the common causative organism, as well as their antibiotic sensitivity patterns.

### Material and Method

**Patients:** A total of 501 antenatal women between 12-16 weeks of gestation from different age & parity groups without any history or signs & symptoms of urinary tract infection attending ANC OPD of S.S.G. Hospital & Medical college Baroda during the year April 2005- March 2006 were included. Relevant clinical information was collected at the time of examination on a pre-designed performa.

**Clinical Specimens:** All patients were instructed to collect clean catch mid-stream urine specimen into a wide-mouthed sterile screw-capped container. Urine samples were immediately taken to the microbiology laboratory and processed. In case of delay, samples were kept in refrigerator, but not for more than 4 hours.

**Material and Methods:** Each of the specimens was subjected to culture by the semi-quantitative standard loop technique on Blood agar & Macconkey agar. With 4mm internal diameter (0.01ml) loop urine culture is done. Culture plates were incubated aerobically at 37°C for 24 hours. Culture plates without visible growth were further incubated for additional 24 hours before being discarded. Colony count of 100 or more equals to  $\geq 10^5$  CFU/ML & considered as significant bacteriuria. The significant isolates were tested by standard microbiological methods. The standardized Kirby-Bauer disc diffusion test of the Clinical and Laboratory Standards Institute was used for antibiotic susceptibility testing and interpretations were carried out accordingly. All the culture media and antibiotic discs were procured from HiMedia Laboratories, Mumbai, India. The panel of antibiotics tested against gram positive and gram negative isolates were Cephalexin (30µg/disc), Cefotaxime (30µg/disc), Ciprofloxacin (5µg/disc), Gentamicin (10µg/disc), Nitrofurantoin (300µg/disc), Nalidixic acid (30µg/disc).

### Results

Single urine samples collected from a total of 501 pregnant women were examined for Asymptomatic Bacteriuria. Out of 501 antenatal women 60 (11.97%) were culture positive. Incidence of asymptomatic

bacteriuria in 21-30 years of age group was more (12.8%) followed by 10.8% in 16-20 years of age group.

**Table 1: Age wise distribution of the pregnant women**

Age in Years	No. Studied	Bacteriuric		Non-Bacteriuric	
		No.	Percentage	No.	Percentage
16 - 20	111	012	10.8%	099	89.18%
21 - 30	375	048	12.8%	327	87.2%
31 - 40	015	000	0.0%	015	100%
Total	501				

**Table 2: Relationship between Parity & Incidence of asymptomatic bacteriuria**

Parity	No. Studied	Bacteriuric		Non-bacteriuric	
		No.	Percentage	No.	Percentage
Primi	183	020	10.92%	163	89.07%
First para	226	023	10.17%	203	89.82%
Second para	086	010	15.15%	056	84.84%
Multiparous	026	007	26.92%	019	73.07%
Total	501	060	11.97%	441	88.03%

Incidence of asymptomatic bacteriuria was more in second para & multiparous compared to Primi & First para. (Table 2)

This study also revealed that incidence of asymptomatic bacteriuria was more in Low Socio-economic status.

**Table 3: Semi-quantitative estimation of Bacteriuria by Standard Loop Technique**

Degree of Bacteriuria by Standard Loop Technique (4 mm Internal Diameter)	No. Studied	Percentage
Significant ( $\geq 10^5$ CFU /ml)	060	11.97%
Sterile (No Growth)	441	88.03%
Total	501	100%

The above Table 3 shows that the significant bacteriuria (showing  $\geq 10^5$ CFU /ml of organism) is present in 60 out of 501 patients attending antenatal OPD clinic. Thus, prevalence of significant bacteriuria is 11.97%. 441 patients out of 501 (88.03%) in antenatal group showed sterile urine showing No growth by standard loop technique.

**Table 4: Incidence of UTI due to Single and Multiple organism**

No.	Organism Isolated	No. of Cases showing Significant Bacteriuria by Standard Loop Technique
1	Incidence of organism due to Single Organism	55 (91.67%)
2	Incidence of organism due to Multiple (Two) Organism	05 (08.33%)

The above **Table 4** shows the incidence of UTI due to Single and Multiple Organism producing various degree of Bacteriuria in pregnant women. Out of 501 cases, 55 cases of infection were due to Single organism and 5 cases due to Multiple (two) organism.

**Table 5: Percentage of various pathogenic organisms isolated from pregnant women**

Sr. No.	Organism Isolated	No. of cases showing significant bacteriuria by culture
1	Staph.aureus	23 (38.33%)
2	E.coli	21 (35.00%)
3	Pseudomonas Spp.	07 (11.66%)
4	Streptococcus Spp.	03 (05.00%)
5	Candida Spp.	03 (05.00%)
6	Proteus mirabilis	02 (03.33%)
7	Acinetobactor Spp.	02 (03.33%)
8	Enterococcus Spp.	02 (03.33%)
9	Klebsiella Spp.	02 (03.33%)

The above **Table 5** show that Staph aureus was the predominant organism isolated (23 out of 60 cases) and E. coli was 2<sup>nd</sup> common isolate (21 out of 60 cases). Pseudomonas spp., Proteus mirabilis, Klebsiella Spp., Acinetobactor Spp., Streptococcus Spp., Enterococcus Spp. and Candida spp. also been isolated.

**Table 6: Different isolates showing Antibiotic Sensitivity pattern**

Organisms	Total No. of Isolates	Cephalexin	Cefotaxim e	Ciprofloxacin	Gentamicin	Nitrofurantoin	Nalidixic acid
Staph. aureus	23	11	15	13	10	17	02
E.coli	21	10	16	14	13	16	09
Pseudomonas Spp.	07	00	04	06	00	00	00
Streptococcus Spp.	03	00	02	02	02	03	00
Candida Spp.	-	-	-	-	-	-	-
Proteus mirabilis	02	01	02	02	01	00	00
Acinetobactor Spp.	02	00	01	01	01	02	01
Enterococcus Spp.	02	00	01	02	01	02	01
Klebsiella Spp.	02	00	02	02	01	01	01
Total	65	22	43	42	29	41	14
Percentage (%)	100	33.84	66.15	64.61	44.61	63.07	21.53

The above **Table 6** shows Antibiotic Sensitivity Pattern of Different Organism isolated in Present study. The organisms were sensitive to Cefotaxime, Ciprofloxacin, Nitrofurantoin, Gentamicin, Cephalexin and Nalidixic acid in decreasing order. Both Gram positive and Gram negative bacteria showed high sensitivity against Cefotaxime, Ciprofloxacin and Nitrofurantoin with a rate of 66.15%, 64.61% & 63.07% respectively.

## Discussion

Risk of UTI were higher in pregnant women mainly because of altered position of the urinary tract and altered level of hormone during pregnancy which facilitate bacteria to move towards the urethra to the kidney and lead to the development of UTI both symptomatic as well as asymptomatic UTI. Early diagnosis of suspected organism and antibiotic treatment is required because UTI can cause serious complications in mother and baby, if proper treatment is not done in time<sup>(2)</sup>. Women showing Positive Urine culture should be treated by proper identification of suspected organism with proper antibiotics to decrease maternal well as fetal morbidities<sup>(9)</sup>.

The prevalence of asymptomatic bacteriuria in our study is 11.97% which is comparable with results of studies by M. Anayet Ullah<sup>(8)</sup>, Nithyalakshmi J.<sup>(3)</sup> and Ade-Ojo IP<sup>(5)</sup>. In contrast, some studies found lower prevalence than our study<sup>(1,2,7,11,14)</sup> and some study reported a higher prevalence than our study<sup>(4,6,9,10,12,13)</sup>. These varying results may have been due to differences in the areas being studied, social habits of the communities being studied and socio-economic status, standards of personal hygiene and education levels of the patients being studied<sup>(4,12)</sup>.

In our study, incidence of asymptomatic bacteriuria in 21-30 years of age group was more (12.8%) followed by 10.8% in 16-20 years of age group. In contrast, some studies reported higher prevalence of asymptomatic bacteriuria between 40%–60% in the age group 21-30 years<sup>(3,10,12)</sup>. Risk of UTI is increased in multiparous women and with older age group<sup>(3,5,6)</sup>.

The predominant organism were *Staph. aureus* (38.33%) followed by *E.coli* (35.00%), *Pseudomonas Spp.*(11.66%), *Streptococcus Spp.*(05.00%), *Candida Spp.*(05.00%), *Proteus mirabilis*(03.33%), *Acinetobacter Spp.*(03.33%), *Enterococcus Spp.* (03.33%), *Klebsiella Spp.*(03.33%). Endale Tadesse also reported *Staphylococcus* as the predominant organism (45.6%)<sup>(13)</sup>. *Staphylococcus* has high prevalence due to poor genital hygiene practices. *E. coli* was also isolated in some studies as predominant organism responsible for causing asymptomatic bacteriuria<sup>(1,2,3,4,5,6,7,8,9,10,14,15)</sup>

Antimicrobial sensitivities and resistance patterns vary from community to community and from hospital to hospital due to the development of resistant strains caused by mis-usage of antibiotics. Gram negative organism were sensitive to Cefotaxime (73.52%), ciprofloxacin (73.52%), Nitrofurantoin (61.76%), Gentamicin (47.00%), Cephalexin(32.35%), Nalidixic acid (32.35%). The Gram positive isolates were sensitive to Cefotaxime (64.28%), Ciprofloxacin (60.71%), Nitrofurantoin (78.57%), Gentamicin (46.42%), Cephalexin (39.28%), Nalidixic acid (10.71%) (Table 6). This study also showed that there was significant resistant to Gentamicin, Cephalexin and Nalidixic acid. Cephalosporins is relatively safer in pregnancy than the administration of fluoroquinolone<sup>(12)</sup>.

## Conclusion

Pregnancy associated bacteriuria is a common infection. The common pathogens responsible for bacteriuria are of faecal Origin. The pattern of antibiotic resistance varied according to bacterial species, and multi-resistant isolates were observed. For all antenatal women, routine urine cultures and antibiotic sensitivity tests has been done for detection of asymptomatic bacteriuria and determine the sensitivity and resistance patterns of isolated uro-pathogens. It is necessary to stop the culture of antimicrobial abuse, and continuous surveillance of multidrug resistant strains is

highly important to follow changes in antibiotic susceptibility patterns over time. So, early screening of pregnant woman for UTI causing bacterial uropathogens and determining their antibiotic susceptibility pattern is an important intervention to prevent complications that may endanger the life of both the pregnant women and foetus.

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