

A prospective study of prevalence, risk factors, isolates & antimicrobial sensitivity pattern in Asymptomatic Bacteriuria among Antenatal women in Rajarajeswari Medical College & Hospital

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Abstract

Introduction: Urinary tract infections are one of the common infections during pregnancy. Asymptomatic bacteriuria is one of the risk factor and clinical manifestation of urinary tract infections. Detection of asymptomatic bacteriuria during pregnancy is important as subsequently 25% of infected women progress to chronic urinary tract infections resistant to chemotherapy. These infections leads to various pregnancy associated maternal complications like pregnancy induced hypertension, maternal anemia, preterm labor and fetal complication like low birth weight which can be prevented by detecting and treating asymptomatic bacteriuria.

Aims and Objectives: This study was carried out to detect the prevalence of asymptomatic bacteriuria in antenatal women attending outpatient department in Rajarajeswari Medical College & Hospital, to identify the common causative organisms responsible for asymptomatic bacteriuria and antimicrobial sensitivity pattern of pathogens isolated.

Material and Methods: 500 asymptomatic pregnant women who attended outpatient clinic in Ob & G department Rajarajeswari Medical College & Hospital Bangalore, Karnataka, India were enrolled. Mid stream of urine was collected by clean catch technique into a sterile container and then subjected to culture & antimicrobial sensitivity test.

Results: Our study showed 12% (60/500) prevalence of asymptomatic bacteriuria among antenatal women. Insignificant bacteriuria in 4% (20/500), growth of contaminants 6% (30/500) and sterile urine 78% (390/500) were seen in samples cultured. Lower socio-economic status, lower level of education, multiparity, advancing maternal age and advancing gestation period were associated with high risk for asymptomatic bacteriuria. The most common organism grown was *Escherichia coli* (*E. coli*) in 40/60 cases (66.66%), followed by *Klebsiella* in 8/60 cases (13.66%), *Enterococcus* in 7/60 (11.66%) and *Staphylococcus aureus* in 3/60 cases (5%). The most effective antimicrobial agent against the isolated organisms was Nitrofurantoin & the least effective were Ampicillin, Amoxicillin & Cotrimoxazole.

Keywords: Antenatal women, Asymptomatic Bacteriuria, Prevalence, Risk factors, Urine Culture

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Introduction

Bacterial infections of the urinary tract are most common in pregnant women & asymptomatic bacteriuria is one of the clinical presentations of urinary tract infection. Asymptomatic bacteriuria is defined as persistent and actively multiplying bacteria in significant numbers i.e., 10^5 bacteria/ml within the urinary tract without causing any obvious symptoms¹. Various studies show prevalence of asymptomatic bacteriuria 5%-12% in Indian pregnant women population where as 2%-10% in western population. A number of conditions like low socio-economic status, multiparity, illiteracy, medical disorders like Diabetes, Sick cell trait are associated with increased incidence of asymptomatic bacteriuria during pregnancy^{2,3}.

Increased susceptibility for urinary tract infections in females are due to shorter urethra & easy contamination of urinary tract with fecal bacterial flora because of close proximity. The pregnant females develop urinary tract infections twice commonly than age matched non-pregnant females due to the muscle relaxant effect of progesterone, various anatomical and physiological changes that occur during pregnancy^{4,5}.

Pregnant women with untreated asymptomatic bacteriuria are more likely to develop maternal complications like acute pyelonephritis, hypertension, anemia & fetal complications like prematurity, low birth weight and perinatal death^{6,7}.

Urine culture is the gold standard diagnostic test for asymptomatic bacteriuria during pregnancy⁷. Prospective, comparative clinical trials have reported that anti-microbial treatment of asymptomatic bacteriuria during pregnancy lowers the risk of subsequent pyelonephritis from 20-30% to 1-4%, lowers the frequency of low birth weight and preterm delivery^{8,9}. Therefore it recommended that urine culture & sensitivity should be done routinely for all pregnant women at least once in early pregnancy to diagnose asymptomatic bacteriuria, so that they can be treated

with appropriate antimicrobial agents⁹. Antimicrobial agents including selective β-lactams, nitrofurantoin, quinolones and co-trimoxazole can be considered for treatment during pregnancy, but the emergence of drug resistant bacteria limits the choice of antibiotics¹⁰.

This prospective study was as there is no such study done in the local population.

Material and Methods

This prospective study was carried out over a period of 1 year from January 2015 to December 2015 in the Department of Obstetrics and Gynecology, Rajarajeswari Medical College & Hospital, Bangalore, Karnataka, India. A total of 500 consenting antenatal women of varying gestational ages attending out-patient clinic during their first visit were included for the study. Exclusion criteria includes

- Antenatal women with symptoms suggestive of urinary tract infection like lower abdomen pain, fever, dysuria, frequency and urgency.
- Patients with history of urinary tract infection during present pregnancy, and those who have taken antibiotic therapy in previous two weeks.
- Patient with diabetes mellitus, chronic hypertension and other pre-existing medical disorders.
- Patients with known congenital anomalies of the urinary tract.
- Patients on immunosuppressant drug therapy

Demographic, social, medical and obstetric data are obtained as per pro-forma. Clinical examination, relevant investigations including obstetric ultrasonography were done to confirm the pregnancy and gestational age. Institutional ethical committee approval was taken for the study.

Sample collection method: Patients were counseled regarding the “Clean Catch Midstream Urine collection Technique”, by cleaning the vulva with a piece of sterile gauze soaked in saline starting from the front and going backwards thrice and then collect the midstream urine sample in a sterile wide mouthed container with a tightly fitting lid. The samples were transported to the lab immediately within 2 hours and processed.

Semi-quantitative urine culture was performed using a calibrated loop. One loopful (0.001ml) of non-centrifuged, well mixed, urine was streaked on each of the sheep blood agar, Mac Conkey agar plates & cysteine lactose electrolyte deficient medium. The culture plates were incubated aerobically at 37°C for 18-24 hours. The bacterial counts were expressed as Colony Forming Units (CFU) per ml. Colony counts yielding bacterial growth of 10⁵ per ml or more of pure isolates were processed further for identification.

Significant Bacteriuria was defined as growth of single bacterial species at a concentration, more than or

equal to 10⁵ CFU per ml. Only patients with significant bacteriuria were included for micro-biological testing. Standard microbiological methods were used to identify the culture isolates & the isolated organisms were tested for antimicrobial susceptibility by the standard Kirby-Bauer disc diffusion method¹¹.

The data obtained was analyzed statistically using SPSS software.

Results

Out of 500 antenatal women urine samples studied for asymptomatic bacteriuria, 390(78%) samples showed no growth, significant bacteriuria was found in 60 (12%) samples and insignificant bacteriuria in 20 (4%) samples and contaminants were grown in 30(6%) samples. Prevalence of asymptomatic bacteriuria was 12% in our study. Table 1

The highest numbers of culture positive cases 35 (58.3%) were seen among pregnant women in the age group of 26-35 years, followed by 15 cases (25%) among the women older than 35 years and 10 cases (16.7%) among women in the 20-25 years Table 2.

Significant association of asymptomatic bacteriuria was noted in antenatal women with low level of education and lower socioeconomic status (72%). Fig. 1

Asymptomatic bacteriuria was seen more in multiparous antenatal cases (55%), than in primiparous antenatal cases (45%) in our study. Fig. 2

In our study, maximum number of culture positive asymptomatic bacteriuria cases i.e. 30 out of 60 (50%) were seen in 2nd trimester followed by 16 (26.7%) in 3rd trimester and 14 (23.3%) in 1st trimester respectively. Table 3

The most commonly isolated organism in our study was Escherichia coli in 40 cases (66.6%), Klebsiella pneumonia in 8 cases (13.6%), Enterococcus in 7 cases (11.6%), Staphylococcus aureus in 4 cases (6.6%), and Citrobacter in 1 case (1.6%). Fig. 3

In our study, highest number of bacterial isolates showed sensitivity to antimicrobial agent Nitrofurantoin (90%), followed by Imepenam (80%), Amikacin (80%), Ceftriaxone (75%) whereas Ampicillin (15%), Co-trimoxazole (15%), Amoxicillin (15%) were found to be least sensitive. Fig. 4

Table 1: Results of Culture

Results of Culture	Number of Cases	Percentage (%)
Significant Bacteriuria	60	12
Insignificant Bacteriuria	20	4
Contamination	30	6
Sterile	390	78
Total	500	100

Table 2: Age distribution of culture positive cases

Age Group (In years)	No. of Cases studied	No. of cases positive for Asymptomatic bacteriuria	Percentage (%)
20-25	140	10	16.7
26-35	210	35	58.3
36 and above	150	15	25
Total	500	60	100

Table 3: Trimester wise Distribution of ASYMPTOMATIC BACTERIURIA Positive Cases

Trimester	No. of Culture Positive Cases	Percentage (%)
1 st Trimester	14	23.3
2 nd Trimester	30	50
3 rd Trimester	16	26.7
Total	60	100

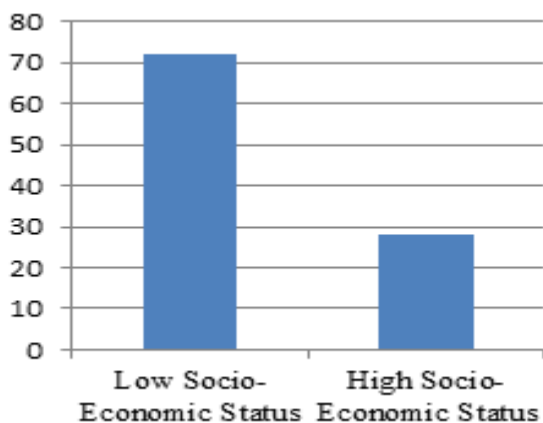


Fig. 1: Distribution of ASB according to Socio-Economic Status

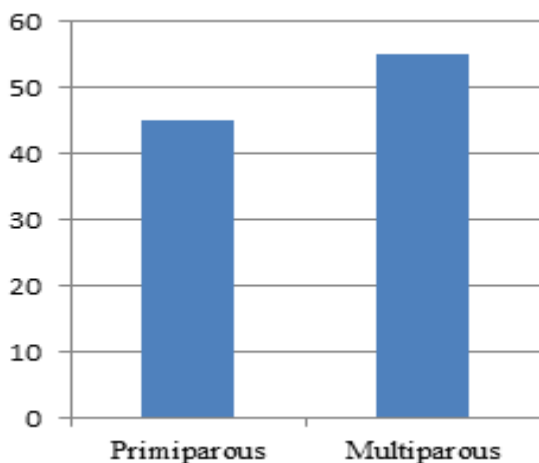


Fig. 2: Distribution of ASB according to parity

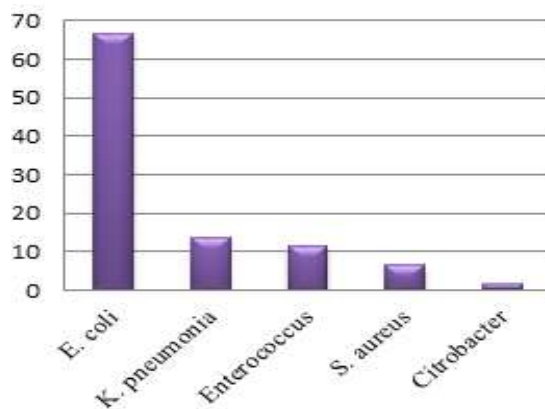


Fig. 3: Distribution of bacterial isolates in culture positive cases

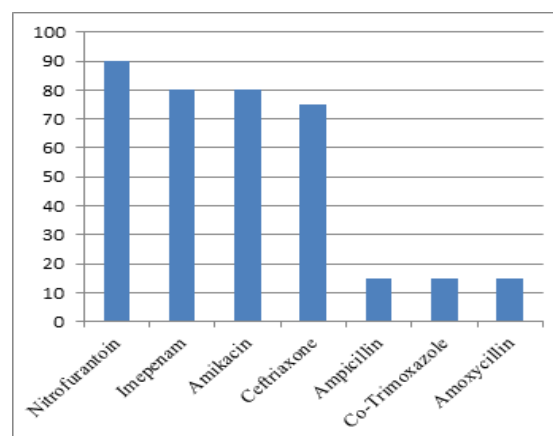


Fig. 4: Pattern of Antibiotic Sensitivity

Discussion

Urinary tract infections are common in women due to shorter urethra. The muscle relaxant effect of progesterone, various anatomical and physiological changes that occur during pregnancy make the pregnant woman twice more susceptible for urinary tract infections. Asymptomatic bacteriuria needs special attention during pregnancy due to its lack of symptoms and associated adverse effects on maternal and fetal outcome. A cost evaluation study reported that screening for pyelonephritis is appropriate when the prevalence of asymptomatic bacteriuria is more than 2%¹². In our study, the prevalence of asymptomatic bacteriuria is 12%, so screening is recommended for all pregnant women.

Asymptomatic bacteriuria is a microbiological diagnosis determined by a gold standard test i.e. urine culture. Present study provides valuable data on the prevalence of asymptomatic bacteriuria in antenatal women, their socio-demographic profile, pattern of culture isolates and the pattern of antibiotic resistance in uropathogens which helps in treatment recommendations.

Among 500 urine samples cultured from asymptomatic pregnant women in our study, 60

samples yielded significant uropathogens, showing a prevalence of 12%. This correlates with prevalence of asymptomatic bacteriuria found in other studies by Muktikesh Dash et al (11.5%), Girish Babu et al (10%), Sudha Biradar et al (9%) and Jayaseelan et al (13%)^{13,14,15,16}. High prevalence rate of asymptomatic bacteriuria noted in pregnancy may be due to stasis of urine produced by gravid uterus, which provides suitable environment for the growth of E.coli strains causing urinary tract infection. Other reason could be due to poor genital hygiene by pregnant women, who may find difficulty in cleaning genitals properly after defecation & urination¹⁴.

There was a higher prevalence of asymptomatic bacteriuria within the age group of 26-35 years (59.7%) in our study which correlated with other studies by Girish Babu et al (60%), Sudha Biradar et al (52%) and Prasanna et al (54%)^{14,15,17}. This high prevalence of asymptomatic bacteriuria in reproductive age group is due to early pregnancy and multiparity which itself is a risk factor for asymptomatic bacteriuria. The incidence is low in younger age group due to the action of hormones and deposition of glycogen which attracts Lactobacillus, which makes the environment acidic & nonconductive for the growth of pathogenic organisms. This protective mechanism becomes less evident with advancing age.

In our study most culture positive cases were seen in 2nd Trimester (50%) which correlates with the studies by Muktikesh Dash et al (61%), Sudha Biradar et al (44.44%)^{13,15}. Many studies have shown increased prevalence in 3rd Trimester¹⁸. Increased prevalence of asymptomatic bacteriuria in pregnancy with advancing gestational age can be explained by stasis of urine due to gravid uterus and interference with the anal and genital hygiene.

Significant association of asymptomatic bacteriuria was noted in antenatal women with low level of education and lower economic status (72%) in our study. Study by Oli et al showed a prevalence of asymptomatic bacteriuria up to 90% in illiterates. Illiteracy leads to ignorance and lack of awareness towards personal hygiene, significance of periodic medical check-up, safe and hygienic sexual practices which can prevent the invasion of urinary tract by pathogens¹⁸.

The most common organism isolated in our study was Gram negative bacteria E.Coli in 66.6% which correlated with other studies by Chandel Latha R et al (79.5%), Muktikesh Dash et al (69.7%), and Sudha Biradar et al (77.77%)^{5,13,15,19}. E. coli is the causative organism in majority of cases due to their ability to attach to urogenital epithelium with the help of adhesin, pili, fimbriae and P-1 blood group phenotype receptors²⁰. The second common organism was Klebsiella pneumonia (13.6%) in our study and was 18% in the study by B. Prasanna et al.²

Treatment of asymptomatic bacteriuria has been shown to reduce the rate of complication, hence regular screening is a standard antenatal care²¹. The chosen antibiotic should be safe for mother and fetus, along with excellent efficacy and low resistance rate. FDA advocates Ampicillin, Amoxicillin, Cephalexin, Cefuroxime, Nitrofurantoin as first line drugs for the treatment of asymptomatic bacteriuria. Nitrofurantoin was the single most effective drug for both Gram negative and Gram positive bacteria²². Higher level of resistance was found in Gram negative isolates than Gram positive isolates¹³. In our study the isolates showed sensitivity to Nitrofurantoin and Imipenam followed by Amoxiclav, Amikacin, Cotrimazole, Ceftazidime. All patients were advised to take treatment as per culture sensitivity report. No further follow up study was done to determine the rate of various complications. But review of literature shows the incidence of prematurity was 75% & low birth weight was 50% in a study by Lavanya SV et. al¹⁹. Incidence of pregnancy induced hypertension was more common in bacteriuric group 9.1% and 6% in abacteriuric group was reported by Mitra P et. al.²³

According to a study by World Health Organization for global burden of disease, leading cause of death and disability in neonates are low birth weight and perinatal causes. World Health Organization developed MOTHER BABY PACKAGE as a universal mechanism to counter the higher rates of neonatal morbidity and mortality²⁴. This initiative can reduce global financial burden drastically as screening and treatment of asymptomatic bacteriuria costs less than managing neonatal complications due to untreated asymptomatic bacteriuria²⁵. Therefore it is better to screen pregnant women early for asymptomatic bacteriuria and treat antenatally to avoid associated maternal and fetal complications, as prevention is always better than cure.

Conclusion

Asymptomatic bacteriuria showed a prevalence of 12% among antenatal women in our study. E. coli was the most common organism identified. The most effective antimicrobial agent found against the isolates grown was Nitrofurantoin. All antenatal women should be screened for asymptomatic bacteriuria by urine culture test routinely as it is the gold standard test. Positive cases should be treated as per the culture sensitivity report and followed up closely for recurrence as these measures will help in reducing maternal and fetal complications due to asymptomatic bacteriuria.

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