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## Original Research Article

# Role of routine urine culture in predicting asymptomatic bacteriuria in pregnancy and the prevalence of asymptomatic bacteriuria in pregnant women - Our experience

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## ABSTRACT

**Introduction:** Asymptomatic bacteriuria (ASB) in pregnancy can flare into frank pyelonephritis and sepsis if untreated due to the low immunity. Apart from causing morbidity in mothers it affects the foetus by increasing the incidence of prematurity and IUGR. The present study was undertaken to determine the prevalence of ASB in the pregnant women attending Ante natal clinic and the significance of routine urine culture.

**Materials and Methods:** Total 310 pregnant women attending the antenatal OPD were enrolled in the study over a period of 10 months. Inclusion criteria included all pregnant women attending antenatal OPD without any urinary symptoms or history of fever. Exclusion criteria included frank UTI symptoms like fever, dysuria, increased frequency of urine, any history of intake of antibiotics, any urinary tract anomaly or renal calculi. Their midstream urine sampling was collected and subjected to both microscopy and culture sensitivity; standard microbiological method was used.

**Results:** The prevalence of ASB was found to be 11.29% and was maximum in second trimester (54.2%). The study revealed routine urine culture is a sensitive test to diagnose ASB. The commonest bacterium isolated was *Escherichia coli* (51.4% cases) and the most effective antibiotic was Nitrofurantoin. The neonatal outcomes are discussed in the text while no perinatal deaths were recorded during the period of study. No direct association of asymptomatic bacteriuria with anaemia and preeclampsia was found, but odds ratio was more than one.

**Conclusion:** The study highlights that asymptomatic bacteriuria is a common occurrence in pregnant women, including urine culture as a part of routine investigation in antenatal patients can help diagnose this condition. Prompt treatment of ASB can prevent any obstetric complication arising from the flareup of asymptomatic bacteriuria in pregnancy and thus reduce maternal and foetal morbidity.

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## 1. Introduction

Asymptomatic bacteriuria is common in pregnancy; certain physiological changes in pregnancy make the women more susceptible to infection.<sup>1-3</sup> Increase in the plasma volume by 15% and increased bladder volume, dilatation of ureters, decreased tone of both ureters and bladder associated with

the presence of oestrogens and progestins cause stasis of urine which results in growth of bacteria.<sup>1,3</sup> Decreased immune status of pregnancy enhances the progression from asymptomatic bacteriuria to frank UTI, cystitis, pyelonephritis and sepsis.<sup>4</sup> Such complications in antenatal period predispose the foetus to preterm births, IUGR and increased foetal morbidity.<sup>1,5</sup>

Urine is routinely subjected to routine examination in all pregnant women to look for the presence of glucose

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and protein, the bacteriuria component is ignored. Routine urine culture test is not carried out for antenatal patients probably due to cost implication and time factor for culture result (usually 48 hours period) instead the strip urinalysis method for assessing urine in pregnant women is preferred.<sup>5</sup> However the strip test cannot assess the extent of infection and the susceptibility of the causative organism to the specific antibiotic. This study emphasises the significance of subjecting all the pregnant ladies to routine urine culture sensitivity. The study brings out the prevalence of asymptomatic bacteriuria in pregnancy and the implications of same on pregnancy in the common clientele.

## 2. Material and Methods

This was a cross sectional study conducted in the clientele belonging to a widespread area in the urban settings. Inclusion criteria included pregnant women at any trimester at the time of booking, no major co morbidities associated, no history of recent fever, chills or dysuria. Exclusion criteria included women with associated renal disorders (renal or ureteric stones, pyelonephritis), history of urinary tract infection. The patients mainly belonged to middle class socioeconomic status, with education level ranging from middle school to post graduates (level of education associated with personal hygiene). The hospital is a 250 bedded set up with busy antenatal OPD. Keeping a screening population of 2500 per year (based on the yearly antenatal OPD attendance) with a desired confidence level of 95% and with accepted margin of error of 5% with a population proportion of 50% the sample size calculated was 329 ( $n = \frac{z^2 \times \rho (1 - \rho)}{\epsilon^2 N}$ ). Applying the

inclusion criteria 321 pregnant patients with no urinary symptoms and no history of fever were enrolled in the study attending the ANC OPD out of which 11 patients were lost to follow up.(Figure 1) Written informed consent was taken from them and hospital ethical committee clearance was taken. Any lady with frank UTI symptoms like fever, dysuria, increased frequency of urine, any history of intake of antibiotics, any urinary tract anomaly or renal stone were excluded from the study. A detailed history of patients was taken age, gravidity, parity, period of gestation, associated co-morbidities, family history of diabetes, hypertension were elicited. Routine investigations were done for every patient and haemoglobin, sugars, HBsAg, HIV, HCV were screened.

Clean-catch midstream urine was collected from each patient into a sterile universal container. Samples were cultured in cysteine lactose electrolyte deficient agar (CLED), using a calibrated drop delivering 0.001ml of urine. Plates were incubated aerobically at 37°C overnight. Colony counts yielding bacterial growth of 100,000/ml or more of pure isolates were regarded as significant

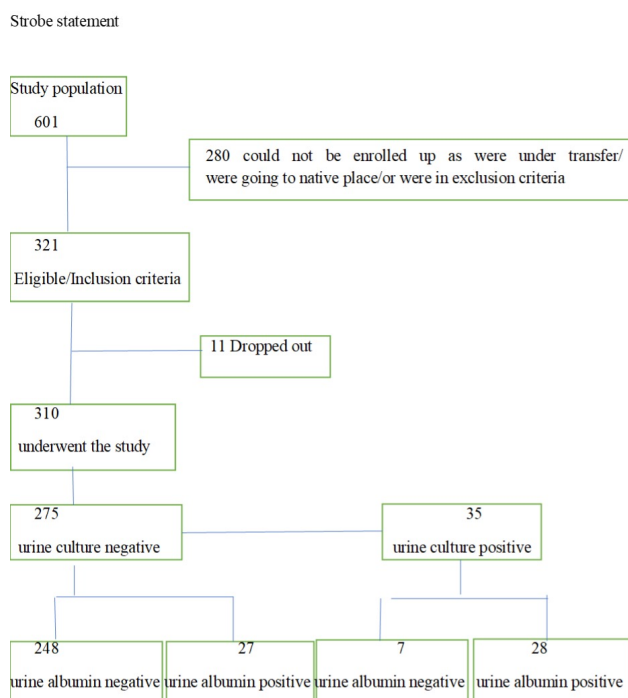


Fig. 1:

for infection. Similarly, 10ml of each patient urine was transferred into sterile centrifuge tubes and then centrifuged at 3000rpm for 10-15 minutes. The supernatant was discarded and the deposit examined microscopically at high magnification for pus cells, red blood cells, epithelial cells, casts, crystals, yeast-like cells and Trichomonas vaginalis. Pus cells > 5 per high power field were also considered significant for infection. The isolated organisms from culture plates were identified by standard laboratory techniques. Antimicrobial in-vitro susceptibility testing was performed on MHA agar disc diffusion method.

The patients with significant bacterial growth in their urine samples were treated with a suitable antibiotic with a proven sensitivity for a course of 7 days followed by a repeat urine culture (only one patient with repeat culture was positive responded to 15 days course and was put on suppressive therapy). The patients were followed up to delivery. Deliveries before 37 weeks were taken as preterm, birth weight below 2.5 kg was taken as low birth weight, any maternal complication was noted. Antibiotic susceptibility to Norfloxacin, Nitrofurantoin, Ciprofloxacin, Ampicillin, Amoxycillin + Clavulanic acid, Gentamycin, Cotrimoxazole, Ceftriaxone, Cefepime, Amikacin, Nalidixic acid, Cefoxitin were tested.

Logistic regression model of statistical analysis was applied to interpret the results. Odds ratios (OR) were computed for exposure to asymptomatic bacteriuria as well as perinatal and maternal outcomes. The perinatal outcomes examined in this study include perinatal death

(fetal death or neonatal death within the first 28 days, low birthweight (2500 g or lower) prematurity (less than 37 weeks gestation), preterm low birthweight (2500 g or lower and less than 37 weeks gestation). Maternal outcomes included preterm labor (onset of labor prior to 37 weeks), hypertension/ preeclampsia (pregnancy-induced hypertension), anemia (hematocrit less than 30%). They were further evaluated and analysed.

### 3. Results

Out of 310 patients subjected to urine culture sensitivity 35 were found to have significant growth in their urine samples. A prevalence rate of 11.29% in the study population was observed. Demographic characteristics of pregnant women screened for asymptomatic bacteriuria (n=310) showed 7 women had their urine sample for albumin negative but their urine cultures were positive for bacteriuria, that amounts to 20% of the sample which were positive. 9% samples are urine albumin positive but urine culture negative so the caution must be exercised if urine albumin is kept as measure of ASB.(Table 1) Of the 35, only 2 had mixed organism growth and the rest had isolated bacterial growth. The commonest bacterium which was detected in culture was *Escherichia coli* (51.4%) as depicted in Figure 2.

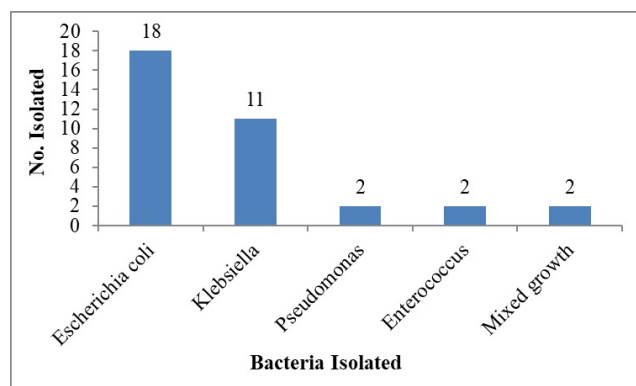


Fig. 2:

The organisms were most susceptible to Nitrofurantoin, followed by Amikacin, Gentamicin, and Ceftriaxone. The organisms were resistant to Norfloxacin, Co-trimoxazole, Amoxicillin + clavulanic acid and Cefixime. The rampant use of the antibiotics could be a reason for the resistance. The patients were prescribed the suitable antibiotic sensitive to the isolated organism for a period of 07 days and subjected to repeat culture sensitivity. Only one patient required an extended course of antibiotic for 15 days to turn her urine culture negative she was continued on suppressive dose.

The incidence of premature neonates and low birth weight infants were more in the asymptomatic group (Table 2). There were no perinatal deaths during the study.

Odds ratio of 6.47 was observed for preterm births. Odds ratio of preeclampsia and anaemia was 2.82 and 3.18 respectively. There was no direct association with anaemia and preeclampsia but odds ratio being more than one was observed in the asymptomatic bacteriuria group.

### 4. Discussion

Asymptomatic bacteriuria is presence of  $10^5$  bacteria per ml of urine with no associated symptoms in the patient like fever, dysuria or polyuria.<sup>1,2</sup> Untreated ASB in pregnancy progresses to symptomatic cystitis in approximately 30% of patients and pyelonephritis in up to 50%.<sup>3,4</sup> Asymptomatic bacteriuria is associated with an increased risk of intra-uterine growth retardation and low-birth-weight infants. The relatively high prevalence of ASB during pregnancy, the significant consequences for women and for the pregnancy, plus the ability to avoid sequelae with treatment justify screening pregnant women for bacteriuria.<sup>4</sup> In the present study prevalence of asymptomatic bacteriuria in the screened clientele was 11.2% which is similar to the prevalence rate reported by Senthinath et al<sup>6</sup> and Kasinathan et al.<sup>7</sup> Various other Indian studies have shown a prevalence rate between 5 and 12%.<sup>8–10</sup> We found a significant difference in the prevalence of ASB with respect to age group ( $P < 0.05$ ). The age group of 26-30 years had maximum number of cases (34%) which is comparable with the previous studies.<sup>7,11–13</sup> Advanced maternal age ( $\geq 35$  years) was reported as risk factor for ASB in pregnancy.<sup>12</sup> Another reason could also be due to the fact that many women within this age bracket are likely to have had many children before the present pregnancy and it has been reported that multiparity is a risk factor for acquiring ASB in pregnancy.<sup>12,13</sup> In current study, 14% prevalence of ASB was in the age group of 35 and above. This could be reasoned due to associated high incidence of diabetes in them. The incidence of ASB was higher in multigravidae (68.57%), which was similar to Obirikorang et al<sup>9</sup> and Sujatha's findings.<sup>10</sup> A higher rate of infection detection was seen in second trimester of pregnancy (54.2%) and this was not statistically significant ( $P=0.277$ ), which is in accordance with the study done by Kasinathan et al.<sup>7</sup> This study showed that the urine albumin is not a very sensitive test to detect the presence of bacteria in the urine as 20% of samples with urine albumin negative turned positive in urine culture, at the same time 10% of urine sample with positive for urine albumin were negative during the urine culture, hence urine routine sample for albumin is not a reliable method to pick up asymptomatic bacteriuria The gold standard for detection of bacteriuria is urine culture, but this test is costly and time consuming (24 to 48 hours) to obtain results.<sup>5</sup> The accuracy of faster screening methods (e.g., leukocyte esterase dipstick, nitrite dipstick, urinalysis and urine Gram staining) has been evaluated Bachman and associates compared these screening methods with urine

**Table 1:** Demographic characteristics of pregnant women screened for asymptomatic bacteriuria (n=310)

Parameters		Presence of bacteriuria	Absence of Bacteriuria
Age in years	<20	1(2%)	6(2.1%)
	21-25	9(25%)	102(37%)
	26-30	12(34%)	116(42%)
	31-35	8(22%)	48(17%)
	>35	5(14%)	3(%)
Gravidity	Primigravida	11(31.42%)	125(45.4%)
	Multigravida	24(68.57%)	150(54.4%)
Trimester	Frist	5(14.2%)	49(17.8%)
	Second	19(54.2%)	123(44.7%)
	Third	11(31.4%)	103(37.4%)
Urine Culture positive	Urine Albumin Present	28(80%)	Urine albumin absent
	Urine Culture negative	27(9%)	7(20%)
			248(91%)

**Table 2:** Perinatal and maternal outcomes

Perinatal Outcomes		Presence of Bacteriuria	Absence of Bacteriuria	Odds ratio
Birth Weight	<2.5Kg	16(45.7%)	20(7.2%)	10.73
	>2.5Kg	19(54.2%)	255(92.7%)	
Gestational Age	<37 weeks	10(28.5%)	16(5.8%)	6.47
	>37 weeks	25(71.4%)	259(94.1%)	
Maternal outcomes		Presence of Bacteriuria	Absence of Bacteriuria	
Preeclampsia	Yes	9(25.7%)	30(10.9)	2.82
	No	26(72.2%)	245(89.9%)	
Anaemia	Yes	7(20.1%)	20(7.8%)	3.18
	No	28(80%)	255(92.7%)	

culture and found that while it was more cost effective to screen for bacteriuria with the esterase dipstick for leukocytes, only one half of the patients with bacteriuria were identified compared with screening by urine culture. The increased number of false negatives and the relatively poor predictive value of a positive test make the faster methods less useful; reiterating that urine culture should be routinely obtained in pregnant women which is emphasised in this study, to screen for bacteriuria at the first prenatal visit and during the third trimester.<sup>5,14</sup>

In the present study, 35 patients showed positive urine culture report, of these only 2 had mixed organism growth and the rest had isolated bacterial growth. The dominant isolates was E.coli which accounted to about 51.4% and the second most common growth was klebsiella around 30%. This finding is correlated well with the other studies.<sup>11,12</sup> Escherichia coli been the most common causative organism could be due to the fact that urinary stasis is common in pregnancy and Escherichia coli strains prefer that environment, they cause UTI.<sup>1</sup> Poor pelvic hygiene maintenance by pregnant women who may find it difficult to clean their pelvic region properly after bowel evacuation may make them susceptible for retrograde infection.

The antimicrobial sensitivity and resistance pattern vary from community to community and from hospital to

hospital. This is because of emergence of resistant strains, caused by indiscriminate use of antibiotics. This study revealed that Nitrofurantoin, Amikacin, Gentamicin, and Ceftriaxone were very effective against most of the urinary isolates. The organisms were resistant to Norfloxacin, Cotrimaxazole, Amoxicillin + clavulnic acid and Cefixime. The rampant use of the antibiotics could be a reason for the resistance. This finding is in accordance with the study done by Kasinathan et al<sup>4</sup> and Imade et al.<sup>8</sup>

The maternal and neonatal complications of a UTI during pregnancy can be devastating. The presence of asymptomatic bacteriuria was associated with premature labor (labor onset before 37 weeks of gestation), hypertensive disorders of pregnancy (such as pregnancy-induced hypertension and preeclampsia), anemia (hematocrit level less than 30 percent).<sup>4</sup> Randomized trials have demonstrated that antibiotic treatment decreases the incidence of preterm birth and low-birth-weight infants.<sup>1</sup> Asymptomatic bacteriuria is associated with intrauterine growth retardation and low-birth-weight infants.<sup>2</sup> With appropriate screening and treatment, this morbidity can be limited. All pregnant women should be screened for bacteriuria and subsequently treated with appropriate antibiotic therapy.<sup>13</sup> Oral nitrofurantoin and cephalixin are good antibiotic choices for treatment in pregnant women with asymptomatic bacteriuria<sup>14</sup> and acute cystitis, but

parenteral antibiotic therapy may be required in women with pyelonephritis.<sup>13,14</sup> Asymptomatic bacteriuria needs to be ruled out in every pregnant lady to prevent the consequences of asymptomatic bacteriuria. All antenatals at AN outpatient should undergo urine culture sensitivity to improve the neonatal and maternal outcome.

## 5. Conclusion

The present study shows 10-15% prevalence of asymptomatic bacteriuria in pregnant women. The study highlights the importance of including urine culture as a part of routine investigation in antenatal care to screen for asymptomatic bacteriuria in pregnancy. Prompt treatment of asymptomatic bacteriuria can prevent any obstetric complication and reduce both maternal and foetal morbidity. It is pertinent to know and follow antibiotic policy to prevent irresponsible use of antibiotics which has resulted in bacterial resistance. The emphasis on personal hygiene be imparted in the antenatal clinic as a part of wholesome health care.

## 6. Source of Funding

None.

## 7. Conflict of Interest

The authors declare no conflict of interest.

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