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Original Research Article

Study of asymptomatic bacteriuria in pregnant women: prevalence, isolates and their antibiotic sensitivity pattern

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ABSTRACT

Background: Asymptomatic bacteriuria (ASB) is common in pregnant women due to morphological and physiological changes in the genitor-urinary tract, which untreated may lead to complications like pyelonephritis and may also effect the fetus. The objective of our study was to determine the prevalence of ASB in pregnant women, to identify the organisms responsible and their antibiotic sensitivity pattern.
Methods: A clean catch midstream urine was collected from 250 pregnant women in different trimesters attending antenatal OPD in a tertiary care hospital. Isolates and their antibiogram were obtained by conventional methods.
Results: Among 250 pregnant women, 23(9.2%) had shown significant bacteriuria, and majority (52.1%) were in 3rd trimester. *Escherichia coli* (56.5%) was the commonest isolate followed by *Klebsiella pneumoniae* (17.4%). Most of the isolates showed sensitivity to imipenam, nitrofurantoin and cefepime.
Conclusions: Asymptomatic bacteriuria is common during pregnancy which requires a routine examination of urine for culture and sensitivity and the positive cases should be treated with appropriate antibiotics to prevent any further complication.

Keywords: Asymptomatic bacteriuria, *Escherichia coli*, Pregnancy

INTRODUCTION

Urinary tract infections or UTIs are common during pregnancy due to morphological and physiological changes occurring in the genitor-urinary tract. Generally, females are more susceptible to UTIs because of the short length of the urethra along with close proximity to the analcanal.[1] Pregnant women are twice commonly affected than normal women due to progesterone effect causing urinary stasis and different anatomical changes occurring during pregnancy.[2] UTIs can be symptomatic or asymptomatic. Asymptomatic bacteriuria (ASB) is defined as presence of actively multiplying bacteria which are more than 10^5 bacteria per milliliter of urine within the urinary tract, excluding the distal urethra without any clinical symptoms.[1,3,4] It is also known as Covert bacteriuria.

The prevalence of ASB was found to be 2-11% in pregnant women. If left untreated, ASB may progress to symptomatic bacteriuria, which could lead to acute pyelonephritis in 20-50% of cases and to adverse obstetric outcomes like prematurity, postpartum hypertension, anaemia, and low-birth weight, fetal mortality.[5,6] Various studies from other countries have documented the prevalence of ASB in pregnancy to be around 2-7% while in India it was found to be between 5-

7%. Study from African countries showed more higher prevalence than India.[5-12]

The commonly reported etiologic agents causing ASB are *Escherichia coli (E. coli), Klebsiella pneumoniae (K. pneumoniae), Proteus mirabilis (P. mirabilis),* Coagulase negative *Staphlyococci* (CoNS).[4-12] ASB is a microbial diagnosis which depends on the isolation of specified count of bacteria in properly collected urine specimen from pregnant women. Semi-quantitative urine culture is Gold standard investigation for detection of ASB.[2,13] Selection of mothers with associated risk factors can be beneficial in early diagnosis. Gestational diabetes, past UTI, multiparity, advanced maternal age, illiteracy, Lowsocio economic status have been reported as risk factors in some studies.[14] The relatively high prevalence of ASB during pregnancy, the significant consequences for the woman and the baby and the ability to avoid complications justify screening for ASB in pregnant women.

The present study aims to know the prevalence of ASB in pregnant women, common etiologic agents and their microbial sensitivity pattern.

METHODS

The study was carried out for a period of six months in the Department of Microbiology, from November 2017 to April 2018, after being approved by the Ethical committee. 250 pregnant women in various trimesters attending the antenatal clinic were included in the study. Pregnant women with UTI symptoms like burning micturition, dysuria, frequency and urgency for micturition etc, with a history of antibiotic intake in previous 2 weeks, pregnancy induced diabetes, pyrexia of unknown origin were excluded from the study. Informed consent was taken from all the women and also detailed history about their literacy, economic status was obtained. Pregnant women were informed about the aseptic precautions to be taken for collection of specimen. They were advised to collect midstream "clean catch" urine into a wide mouth sterile universal sample container with a tight fitting lid. Samples were transported immediately to the laboratory and processed.

Samples were subjected to macroscopic examination, noting the colour, clarity and odour. Wet film examination was done for presence of puscells, RBC etc. Direct Gram stain was performed for presence of puscells and bacteria or yeasts. Samples were cultured on 5% sheep blood agar, MacConkey agar, Nutrient agar and Cysteine Lactose Eletrolyte Defiecient (CLED) agar by standard loop method and plates were incubated at 37^0C overnight. A colony count of 10^5 with pure growth was taken into account and processed further for identification by standard biochemical tests. Antibiotic sensitivity testing was done by Kirby-Bauer disc diffusion method on Muller-Hinton agar plates with following antibiotic discs provided by HiMedia: Ampicillin (10µg), amoxicillin-clavulanic acid (20/10µg), cefuroxime (30µg), ceftrioxone (30µg), cefepime(30µg), ciprofloxacin (5µg), nitrofurantoin (300µg), norfloxacin (10µg), co-trimoxazole (25µg), imipenam (10µg), vancomycin (30µg), linezolid (30µg). Zone of Inhibition was measured and interpreted according to CLSI guidelines.[15]

RESULTS

Present study included 250 pregnant women attending antenatal OPD at a tertiary care Hospital. Among 250 women screened 23 (9.2%) have showed significant bacteriuria and 196 (78.4%) were sterile (Table 1).

Table 1: Results of culture.

Culture Result	Number of cases with percentage
Significant Bacteriuria	23 (9.2%)
Insignificant bacteriuria	4 (2%)
Contamination	27 (10.8%)
Sterile	196 (78%)
Total	250

Out of 23 positive cases of significant bacteriuria, 12 (52.1%) were in the age group of 21-25years, 7 (30.4%) in 26-30years and 2 (8.6%) each in 18-20 years and 31-35 years. No case isolated among 36-40 years age group. And among these women majority 12 (52.1%) belong to third trimester, 6 (26.1%) were in second trimester and 5 (21.7%) were in first trimester (Tables 2 and 3).

Table 2: Distribution of cases according to age.

AGE (in years)	Number of cases with percentage
18-20	2 (8.6%)
21-25	12 (52.1%)
26-30	7 (30.4%)
31-35	2 (8.6%)
36-40	0 (0)
Total	23 (100%)

Table 3: Distribution of cases according to trimester.

Trimester	Number of cases with percentage
1st	5 (21.7%)
2nd	6 (26.1%)
3rd	12 (52.1%)
Total	23 (100%)

Out of 23 culture positive cases, *Escherichia coli* was the predominant isolate in 13 (56.5%) cases, followed by *Klebsiella pneumoniae* 4 (17.4%), *Staphylococcus aureus* and *Enterococcus spp.* 2 (8.69%) cases each and Coagulase negative *Staphylococci* and *Proteus mirabilis* 1 (4.3%) case each (Table 4).

Table 4: Distribution of bacterial isolates.

Bacterial isolate	Number of isolates with percentage
Escherichia coli	13 (56.5%)
Klebsiella pneumonia	4 (17.4%)
Staphylococcus aureus	2 (8.7%)
Enterococcus spp	2 (8.7%)
CoNS	1 (4.3%)
Proteus mirabilis	1 (4.3%)
Total	23 (100%)

The antibiotic sensitivity testing of the isolates showed that all the isolates were sensitive to imipenam, most of them were sensitive to ceftrioxone, cefepime, co-trimoxazole and norfloxacin. Gram positive organisms i.e *Staphylococcus aureus*, CoNS, *Enterococcus* are sensitive to linezolid and vancomycin. Among 13 *Escherichia coli* isolates, 4(30.7%) were sensitive to ampicillin, 8(61.3%) to amoxyclav, 2(15.2%) to cefuroxime, 7 (53.8%) to ciprofloxacin, 5 (38.4%) to co-trimoxazole and 9 (69.2%) each to Norfloxacin and nitrofurantoin. Among *Klebsiella pneumoniae* isolates 100% showed sensitivity to imipenam and cefepime, 50% to amoxyclav, cefuroxime, co-trimoxazole, nitrofurantoin and 75% sensitivity to norfloxacin, ciprofloxacin, ceftrioxone. *Proteus mirabilis* isolate was resistant to ampicillin, cefuroxime, nitrofurantoin and sensitive to all others. Among the gram-positive isolates, *Staphylococcus aureus* showed resistance to ampicillin, cefuroxime, 50% sensitivity to amoxyclav, ceftrioxone, ciprofloxacin, cotrimoxazole, 100% sensitive to vancomycin, linezolid. CoNS were sensitive to all antibiotics except ampicillin and cefuroxime. *Enterococcus* isolates were 100% sensitive to vancomycin, linezolid, nitrofurantoin and 50% to amoxyclav, ciprofloxacin, norfloxacin (Table 5).

Table 5: Antibiotic sensitivity pattern of the isolates.

	E. coli	*K. pneumoniae*	*Proteus*	*S. aureus*	CoNS	*Enterococcus*
AMP	4(30.7%)	1(25%)	0	0	0	1(50%)
AMC	8(61.5%)	2(50%)	1(100%)	1(50%)	1(100%)	1(50%)
CXM	2(15.2%)	2(50%)	0	0	0	--
CTR	10(76.9%)	3(75%)	1(100%)	1(50%)	1(100%)	1(50%)
CPM	12(92.3%)	4(100%)	1(100%)	2(100%)	1(100%)	2(100%)
CIP	7(53.8%)	3(75%)	1(100%)	1(50%)	1(100%)	1(50%)
COT	5(38.4%)	2(50%)	1(100%)	1(50%)	1(100%)	2(100%)
NIT	9(69.2%)	2(50%)	0	-	-	-
NX	9(69.2%)	3(75%)	1(100%)	2(100%)	1(100%)	1(50%)
IPM	13(100%)	4(100%)	1(100%)	2(100%)	1(100%)	-
VA	-	-	-	2(100%)	1(100%)	2(100%)
LZ	-	-	-	2(100%)	1(100%)	2(100%)

AMP-Ampicillin, AMC-Amoxyclav, CXM- Cefuroxime, CTR-Ceftrioxone, CPM-Cefepime, CIP-Ciprofloxacin, COT-Cotrimoxazole, NIT-Nitrofurantoin, NX-Norfloxacin, IPM-Imipenam, VA-Vancomycin, LZ-Linezolid

DISCUSSION

Asymptomatic bacteriuria (ASB) in pregnant women pose a risk to mother as well as the baby which may result in pyelonephritis, premature delivery, PPH, also foetal mortality. Women with bacteriuria are at 20-50 fold higher risk of developing pyelonephritis than who are without bacteriuria.[5] Prevalence of ASB increases with parity and advanced maternal age.[13] To avoid complications routine screening for ASB should be done for pregnant women.

In present study, prevalence of ASB is 9.2% which correlates with studies done by Sujatha R et al, (7.3%), Mukherjee et al, (8.4%), Jayalakshmi J et al, (7.4%), but in contrast to studies by Khan S et al (23.4%) and Patnaik et al, (25.3%) who reported a higher prevalence of ASB.[4,16-19] Most of the women with ASB in our study belong to age group between 21-30 years, maximum number (52.17%) being between 21-25 years followed by 26-30 years (30.43%). This is in line with studies by Mukherjee et al, (61.9%) and Bose et al, (48.28%) but in contrast with studies by Prasanna B (37%) et al, Senthinath TJ et al, (30.7%).[17,20-22] In present study ASB was more prevalent in women in 3rd trimester (52.1%) followed by 2nd trimester (26.1%), this correlates with studies by Patnaik et al (53.6% and 22.8%), Prasanna B et al (49% and 29%) but in opposition to studies by Mukherjee et al showing 44.4% in 2nd trimester and Sujatha R et al (45.4%) showing highest prevalence in 1st trimester [16].[19,21,17]

In present study *Escherichia coli* was the predominant isolate accounting 56.5%, similar results were reported by Sujatha R et al, (77.2%), Mukherjee et al, (57.1%), Khan S et al, (61.5%), Prasanna B et al, (62%)whereas

studies by Patnaik et al, (23.5%) and Ramalingam et al, (26.9%) reported *Klebsiella pneumoniae* as predominant isolate opposing our result.[16-18,21,19,23] A study from Nigeria showed *Staphylococcus aureus* (72%) as commonest isolate and *E. coli* being the least (2%).[24] The organisms isolated can be faecal in origin colonizing in the periurethral area. Different determinants of virulence such as presence of adhesions, capsule and urine stasis produced by gravid uterus play a role in causation of UTI.

Antibiotic sensitivity testing showed that all the isolates were sensitive to imipenam which is in line with studies by Sujatha R et al, Khan S et al, Patnaik et al, Bose et al, whereas study by Prasanna B et al, reported 90% sensitivity.[16,18-21] Many isolates were resistant to Ampicillin and first generation cephalosporins. Among the gram negative isolates, *E. coli* was sensitive to amoxyclav (61.5%), ceftriaxone (76.9%), cefepime (92.3%), norfloxacin and nitrofurantoin (69.2%). Similar results were reported by Sujatha R et al, Khan S et al, Patnaik et al, Mukherjee et al, but a study from Iran reported a different result for nitrofurantoin (29.12%).[16-19,25] Among the gram positive isolates, all isolates were 100% sensitive to cefepime, vancomycin, linezolid, imipenam and nitrofurantoin. Studies by Patnaik et al and Bose et al, reported similar results, the increase in antibiotic resistance patterns were may be due to self medication and antibiotic abuse.[19,20] Low costs and easy availability of drugs are other factors contributing to antibiotic resistance.

CONCLUSION

Asymptomatic bacteriuria (ASB) was found prevalent in 9.2% of pregnant women more in 3rd trimester with *Escherichia coli* being the predominant organism in our study. If untreated may result in complications for both mother and baby so routine screening of pregnant women for ASB should be done irrespective of the trimester, once in each trimester. Appropriate antibiotics should be prescribed according to sensitivity results and self medication of antibiotics should be strictly prohibited.

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