

Prevalence of asymptomatic bacteriuria in pregnancy at a tertiary care centre.

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Abstract:

Introduction: Asymptomatic bacteriuria (ASB) is the presence of significant bacterial counts (more than 10^5 colony-forming units) in urine, in the absence of any urinary symptoms. The condition may not require any active treatment in normal individuals. However, in pregnant patients, it is of undue significance since it adversely affects the pregnancy outcomes. Hence asymptomatic bacteriuria in pregnancy becomes significant. This study was done in order to review the prevalence, antimicrobial susceptibility profile, and factors associated with ASB occurring in pregnant mothers, being treated at a tertiary care hospital.

Material and methods: A total of 450 patients were evaluated and 440 patients were included in the present prospective study. None of the patients had any symptoms of urinary tract infection. The method of urine sample collection was clean catch mid-stream urine into a sterile container. All the samples were examined in the laboratory by microscopy and culture and sensitivity. The bacteria isolated were studied and the species were identified by standard microbiological methods.

Results: A total of 440 patients were included in the study, out of which 61 (13.8 %) patients tested positive for ASB. The most common isolates were *E. coli* (42) followed by *Klebsiella* (10), *enterococcus faecalis*, *staphylococcus aureus*, and *proteus mirabilis*. The majority of cases belonged to 21-30 years of age group.

Conclusion: Asymptomatic bacteriuria when detected in pregnancy carries a high risk of obstetric complications. Hence routine urine culture tests should be performed in all antenatal women. All the patients who had urine culture positivity should be promptly treated with appropriate antibiotics. Routine USG should be done to rule out anatomical variations of the urinary tract.

Key words: asymptomatic bacteriuria, pregnancy, urinary tract infection, maternal and fetal complications

Introduction:

Asymptomatic bacteriuria (ASB) in pregnancy is defined as the presence of a significant quantitative count of bacteria in the urine, (more than 10^5 colony forming units per ml of urine) in clinically asymptomatic pregnant patients.^{1,2} The prevalence of ASB in pregnancy is about 10%.³ However, the prevalence of ASB varies, as noted in various literature studies. Due to its high prevalence and associated complications, it is required to screen pregnant mothers for bacteriuria.

Pregnancy increases the risk of developing urinary tract infection (UTI) and also ASB. The maternal physiological hydronephrosis, decreased ureteral and bladder tone due to increased oestrogen and progesterone, all these combinedly cause urinary stasis and thus predispose to urinary tract infections (UTI). Glycosuria in pregnancy is also another factor that can predispose to UTI in pregnancy. The Lower levels of serum interleukin-6 and serum antibody responses to *E. coli* antigens in pregnancy have also been associated with increased incidence of asymptomatic bacteriuria in pregnancy.³

The chances of asymptomatic bacteriuria progressing into symptomatic UTI is common in pregnancy, which has adverse maternal and fetal outcomes. Fetal complications that can occur due to asymptomatic bacteriuria include intrauterine growth restriction, low birth weight, and pre-term premature rupture of membrane. The maternal complications which are associated with asymptomatic bacteriuria are hypertension, pre-eclampsia, and maternal anemia. All these are well documented in the literature.^{4,5} Without treatment, this can lead to symptomatic conditions like acute cystitis in about 30% of pregnant patients. It is estimated that some 50 % of acute cystitis patients in pregnancy will progress to acute pyelonephritis which has adverse maternal and fetal outcomes. Hence it becomes very important to identify all ASBs in pregnancy and treat them with appropriate antibiotics.

Material and methods:

The study was a prospective study carried out in the Department of Obstetrics at a tertiary care center over a duration of 1 year. Pregnant patients who attended the antenatal clinic were included in the study. Exclusion criteria were those who had symptoms of UTI, history of diabetes and hypertension, history of antibiotic treatment for UTI in the past. Patients with anatomical abnormalities of urinary tract on USG were also excluded. Ethical clearance was taken from the institutional ethical committee. Informed consent was taken from all patients. All the urine samples were collected as mid-stream clean catch urine samples in a sterile container. The samples were analyzed by standard microbiological techniques. The urine samples were plated on MacConkey’s agar, Sheep Blood agar (in 5-10% CO₂ atmosphere), and Cystine Lactose Electrolyte Deficient agar, by standard loop method. The plates were incubated at 37°C. Colony counts were interpreted as significant and insignificant according to the standard criteria. The organisms were identified by routine methods from the samples which showed significant bacteriuria. The standardized Kirby-Bauer disc diffusion test was used for antibiotic susceptibility testing and interpreted accordingly.⁶ The antibiotics which were tested were ampicillin (10mcg), amoxycylav (20/10mcg), amikacin (30mcg), clindamycin (2mcg), cefipime (30mcg), ceftriaxone (30mcg), cefuroxime (30mcg), ciprofloxacin (5mcg), co- trimaxazole (25mcg), erythromycin (15mcg), fosfomycin (200mcg), penicillin G (10units), imipenem (10mcg) and meropenem (10mcg).

Results:

A total of 450 patients were screened. 10 patients were excluded from the study due to maternal DM and previous treatment for UTI. Hence 440 patients, who met the study criteria were included in the study. Among the 440 patients who were included in the study, 61 (13.86 %) patients tested positive for urine culture [table 1].

Among the patients who tested positive for urine culture, 30 patients were primigravida and 31 patients were multigravida. The highest incidence of asymptomatic bacteriuria was noted in the age group of 21-30 years [table 2]. Among the patients who tested positive for ASB, 26 patients belonged to the first trimester, 25 patients belonged to the second trimester and 10 patients belonged to the third trimester. The most common bacteria that was isolated was Escherichia coli [Table 3].

Escherichia coli, the most common isolate, was found to be sensitive to ampicillin and to amoxicillin-clavulanic acid. Broad spectrum penicillins like imipenem, and meropenem showed more sensitivity. Klebsiella pneumoniae, the second most frequent organism was 50% sensitive to ampicillin, while sensitivity to amoxicillin-clavulanic acid was 50%. Sensitivity to cefuroxime was 50% and that for cefepime, ciprofloxacin, ceftriaxone, imipenem and meropenem was 100% [Table 4].

Table 1: Showing percentage of cultures positivity.

Results of culture	Number of cases	Percentage
Significant bacteriuria	61	13.86
Insignificant bacteriuria	4	0.90
Contamination	10	2.27
Sterile	365	82.95
Total	440	100

Table 2: Distribution of Culture Positive Cases with respect to age

Age group	No of cases	percentage
<20	6	9.1
21-30	45	73.77
31-40	10	16.39

Table 3: Distribution of bacterial isolates in positive culture

Name of Isolate	Number of cases	Percentage
Escherichia coli	45	73.77
K.pneumonia	10	16.39
Enterococcus faecalis	1	1.63
Proteus mirabilis	3	4.91
Staphylococcus aureus	2	3.27
Total	61	100

Table 4: Antimicrobial susceptibility pattern of the isolated organisms

	E. coli n (%)	Klebsiella pneumonia n (%)	Proteus mirabilis n (%)	Staphylococcus aureus n (%)	E. faecalis n (%)
AMP	27 (61)	5(50)	0	0	1 (100)
AMC	31 (70)	5(50)	3 (100)	ND	ND
AK	44 (99)	10(100)	3 (100)	ND	ND
CPM	45 (100)	10(100)	3 (100)	ND	ND
CTR	42 (95)	0	3 (100)	ND	ND
CIP	42 (95)	10(100)	3 (100)	ND	ND
CD	ND	ND	ND	2 (100)	ND
COT	ND	ND	ND	2 (100)	1 (100)
CXM	37 (84)	10(100)	3 (100)	ND	ND
E	ND	ND	ND	0	ND
FO	ND	ND	ND	ND	1 (100)
P	ND	ND	ND	ND	1 (100)
IPM	45 (100)	10(100)	3 (100)	ND	ND
MEM	45 (100)	10(100)	3 (100)	ND	ND

AMP - Ampicillin, AMC - Amoxyclav, AK - Amikacin, CPM - Cefepime, CTR -Ceftriaxone, CIP - Ciprofloxacin, CD - Clindamycin, COT- Co-trimoxazole, CXM - Cefuroxime, E- Erythromycin, F- Fosfomycin, IPM - Imipenem, MEM -Meropenem, P - Penicillin-G

Discussion:

Asymptomatic bacteriuria in pregnancy is a serious medical condition that needs medical attention. If untreated, the condition can progress to acute urethritis, cystitis, or pyelonephritis and sepsis. Although ASB may not cause any problems in non-pregnant females, it can cause serious morbidity and rarely mortality in

pregnant females.

ASB can cause preterm labour, low birth weight babies, IUGR, maternal morbidity like maternal hypertension, pre-eclampsia, and anaemia. In extreme cases of pyelonephritis, it can lead to sepsis and ARDS (acute respiratory distress syndrome). The majority of UTI occurs as ascending infections.^{7,8}

Urine culture is considered the gold standard for diagnosis of urinary tract infection. In our study, the prevalence of ASB was 13.6 %. Neupane et al reported a prevalence of 26%, while Imade et al and Sujatha et al reported a prevalence of 45% and 7.3 % respectively.^{9,10,11} This variation may be seen because of differences in the environments, social habits of the community, socio-economic statuses, the standards of personal hygiene and education of the patients who were studied.

In the present study, the age group of 21-30 years showed the highest prevalence of infection (73.77%), followed by the age group of 31-40 years (16.39 %). Alghalibi et al., reported a higher prevalence of UTIs in pregnant women who were aged 21-25 years.¹² Turpin et al., reported a higher prevalence of ASB in pregnant women who were aged 35-39 years.¹³ In another study advanced maternal age (of ≥ 35 years) was reported as a risk factor for asymptomatic bacteriuria.¹⁴ The observed trend of bacteriuria in this study and reports from other studies showed that the age range of 21-40 years served as the high risk group for the development of UTIs in pregnant women. The incidence of ASB in multigravidae was 50.8 percent. Similar results were found in Roy et al.¹⁵

In our study, we noted a higher rate of infection in the first trimester of pregnancy, which was similar to that seen in the study of Yahodara et al.,¹⁶ Studies done by Roy et al.,¹⁵ and Nath et al.,¹⁷ reported high rates of infection detection in the second trimester. Turpin et al, reported a high percentage of asymptomatic bacteriuria in the first and early second trimesters of pregnancy and attributed it to pregnant women reporting at the antenatal clinic for booking during these periods.¹³ The higher incidence in the first trimester could be caused by hormonal changes occurring prior to the occurrence of anatomical changes. Moreover, the earliest study done by Kass explains that there is a rare acquisition of bacteriuria after the second month of pregnancy.¹⁸

The perineal region is colonized by bacteria which is of fecal origin. The bacteria that are responsible for asymptomatic bacteria are of same fecal origin. Studies done by different authors Chandel et al.,²⁰ Enayat et al.,²⁰ Obirikorang et al.,²¹ Imade et al.,¹⁰ Khattak et al.,²² Jain et al.,²³ and Senthinath et al.,²⁴ have shown that *Escherichia coli* was the commonest isolate. In our study, we found similar results (73%). The antimicrobial sensitivity and resistance pattern vary from one place to another and also in different medical setups. The indiscriminate use of antibiotics has caused the emergence of resistant strains. In our study, the isolates showed 100% sensitivity to imipenem and meropenem. Among the aminoglycosides, amikacin showed 99% sensitivity. Ampicillin and Amoxicillin-clavulanic acid are two oral antimicrobial agents that are frequently prescribed for UTIs in pregnant women. Our culture results showed 61% and 70% sensitivities to these agents, respectively. Cefuroxime is another drug that is commonly prescribed orally for treating ASB, and sensitivity to this drug was 86%, which was comparable to sensitivities shown by ceftriaxone (95%) and cefipime (100%). Two of the isolates were multi-drug resistant; one among them was *Escherichia coli*, which was an Extended Spectrum Beta Lactamase (ESBL) producer and the other was *Klebsiella pneumoniae*. Both were sensitive to imipenem and amikacin. Gram-positive microorganisms were also found to be important causes of ASB in some studies in the literature. Enayat et al.,²⁰ reported that up to 16.8% of the causative organisms of ASB were Coagulase-negative *Staphylococcus*. *Staphylococcus aureus* was the most common Gram-positive microorganism (3.2 %) found in our study. Nitrofurantoin is relatively safe in pregnancy and is effective against most of the organisms causing UTIs. It may cause hemolysis in a glucose-6-phosphate dehydrogenase deficient infant when it is used close to term of pregnancy. Hence, it was not used in our study.²⁵

The increase in antibiotic resistance patterns could have been caused by antibiotic abuse and self-medication. The low costs and availability of drugs could be other factors contributing to antibiotic resistance.

Conclusion:

Asymptomatic bacteriuria has significant economic burden. The prevalence of ASB in our study was 13.8 %. This asymptomatic bacteriuria in pregnancy may cause significant maternal and fetal complications in susceptible individuals. This can be prevented if the pregnant mothers are screened appropriately at each trimester and promptly treated according to cultures. The antibiotic susceptibility differs among various locations. Hence this study signifies the importance of screening all women in the antenatal period for ASB.

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