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Screening for asymptomatic bacteriuria during pregnancy

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Abstract
Introduction: UTIs are the most common bacterial infection during pregnancy. Asymptomatic bacteriuria is common in women due to short urethra and close proximity of perineum to the anal region. It is more common in elderly patients and in pregnancy due to progestrone effect in addition to different morphological and physiological changes during pregnancy. Detection of ASB in antenatal women is important, as, undetected and evaluated ASB may lead to symptomatic infection during pregnancy, acute pyelonephritis, postpartum UTI, anaemia, preterm labour, LBW, perinatal death of the fetus. Urine culture is the gold standard screening technique for ASB during pregnancy.
Aims and Objectives: To find out the prevalence of ASB in pregnant women and to find the pattern of causative organism.
Material and Methods: A total of 500 pregnant women aged between 18 to 35 years were studied over a period of 1 and 1/2 years at GMC, Amritsar. Clean midstream urine samples were collected into a sterile container and then subjected to culture method.
Results: Out of the 500 pregnant women, 78 (15.6%) had significant bacteriuria. High percentage of ASB was seen in 2nd trimester (52.56%). (*E. coli*) (53.8%) was the most common organism followed by Staphylococcus aureus (17.9%).
Conclusion: ASB is not uncommon in antenatal patients. All pregnant women should be screened by urine culture to detect ASB at their first visit to prevent overt UTI and other complications in both mother and fetus.

Keywords: Urinary Tract Infection, Asymptomatic bacteriuria, antenatal, pregnant women

Introduction
Urinary Tract Infection (UTI) refers to both microbial colonization of the urine and tissue invasion of any structure of the urinary tract [1]. It is the most common indication for antimicrobial use in hospitals and a significant proportion of this use is inappropriate or unnecessary. It is of two types, symptomatic or asymptomatic [2].
Asymptomatic bacteriuria (ASB) is defined as the "presence of actively multiplying bacteria within the urinary tract excluding the distal urethra", at a time when the patient has no urinary symptoms [3]. Urine culture in ASB reveals a significant growth of pathogens, that is greater than 10 [5] bacteria/ml. It can be found in both pregnant and non pregnant women. [4] It is common in women and increases in prevalence with age and/or sexual activity, due to short urethra, pregnancy, and easy contamination of urinary tract with fecal flora [3, 5]. The pregnant women are two times more commonly affected than age matched non pregnant females [6, 7]. This is due to urinary stasis due to progesterone effect in pregnancy in addition to different morphological & physiological changes occuring during pregnancy. It begins as early as 6 weeks and is seen maximum during 22 to 24 weeks of gestation [8].
Asymptomatic clinical state has been related to the absence of Type 1 fimbriae found in certain strains of bacteria particularly (*E. coli*). This fimbriae is immunogenic and its presence initiates the immune/inflammatory response, which leads to development of symptoms where as its absence leads to absence of symptoms [9]. The prevalence is higher among individuals in lower socioeconomic classes and those with a past history of asymptomatic urinary tract infection [10].
ASB prevalence rates in pregnancy range between 1.9 to 15%. The risk of vertical transmission of bacteria is important, particularly given ASB is more persistent, and more frequently progresses to sUTI in pregnancy compared to other populations (e.g. 20 – 40% of untreated

cases progress to sUTI, which is complicated by premature delivery in 20-50%) [11, 12]. Asymptomatic bacteriuria is a microbial diagnosis based on the isolation of a specified quantitative count of bacteria in a properly collected specimen of urine from pregnant women without signs or symptoms of UTI. Thus urine culture is the gold standard screening technique for asymptomatic bacteriuria during pregnancy [8, 13].

Screening and treatment of pregnant women with ASB reduces the risk of pyelonephritis and adverse obstetrical outcomes like premature delivery, anaemia, pre-eclampsia, PROM, delivering a LBW infant, perpeural sepsis [11, 12, 14, 15]. Untreated asymptomatic bacteriuria leads to the development of symptomatic cystitis in approximately 30 percent of patients and can lead to the development of pyelonephritis in up to 50% women [16]. The aim of our study was to find out the prevalence of ASB in pregnant women and to find the pattern of causative organism.

Materials and Methods

It was a prospective study which was conducted in out patient Department of Obstetrics and Gynecology, Bebe Nanki Mother and Child Care Center, Govt. Medical College Amritsar. A total of 500 patients were recruited in study attending antenatal clinic of Bebe Nanki Mother and Child Care Hospital, Govt. Medical College, Amritsar. The procedure was explained to the patient and all questions and queries were answered. Then a written informed consent was signed and urine sample was sent for culture and sensitivity. The study lasted for 1½ years. The study was done after approval from Institutional Ethical Committee of Government Medical College, Amritsar.

Inclusion criteria

- Age between 18-35 year.
- Any gestational age
- First antenatal visit

Exclusion criteria

- Age (below18- above 35).
- Associated medical conditions like Diabetes Mellitus type-2, moderate to severe anemia, hypertension.
- Associated renal pathology like any renal disease or renal stones, known congenital anomalies of urinary tract.
- Associated leaking, bleeding per vagina.
- Previous history of symptomatic UTI during pregnancy.
- History of antibiotic therapy in previous 2 weeks.
- Pyrexia.

Sample collection

Urine samples were collected by mid-stream "clean catch" method from all the pregnant women with labia separated, in a sterile, wide-mouthed labelled container that was covered with a tightly fitted lid.

Transport of sample

Samples were transported to microbiology department as soon as possible to avoid any misinterpretation of the results as urine is a good culture medium. If the delay is unavoidable, the specimens would be refrigerated at 4°c maximum upto 24 hours.

Processing

All the samples pass through following steps.

1). Microscopic examination of a wet film of uncentrifuged urine was carried out to detect the presence of pus cells, erythrocytes, microorganisms, casts etc. The samples were processed using standard microbiological procedures.
2). Routine culture
3). Direct sensitivity
4). Routine sensitivity of positive culture.

Microbiological method used

The samples were processed using standard microbiological procedures (semi quantitative method- Standard loop technique). The specimens were cultured on MacConkey's agar, Sheep Blood agar by standard loop method and incubated at 37°C overnight. Culture results were interpreted as being significant and insignificant, according to the standard criteria. The organism were identified by routine methods from the samples showing significant bacteriuria (only the sample showing more than 1 leucocyte per 7hpf is considered as significant bacteriuria).

The results obtained form urine c/s reports are studied, growth of different organisms is noted down. The data is compiled and the results are obtained.

Results

Out of 500 pregnant women examined for asymptomatic bacteriuria, 422 (84.4%) samples were sterile with no growth. Significant growth of bacteria was detected in 78(15.6%) samples. (Table 1)

Table 1: results of urine culture and sensitivity

Results of culture	No. of positive culture cases	Percentage
Significant bacterial growth detected	78	15.6
Significant bacterial growth not detected	422	84.4
Total	78	100.0%

The maximum number of culture positive cases were among pregnant women in the age group of 21-25 years (51%), followed next by 26-30 years (36%), followed next by 31-35 years (10%), followed by next group ≤ 20 years (3%). The youngest among the cases studied was 18 years old and the oldest was 35 years of age. (Table 2)

Table 2: Age distribution of culture positive cases

Results of culture	No. of positive culture cases	Percentage
≤ 20 years	2	3.0%
21 – 25 years	40	51.0%
26 – 30 years	28	36.0%
31 – 35 years	8	10.0%
Total	78	100.0%

Significant bacteriuria was detected in equal numbers of primigravidas (50%) and multigravidas (50%). (Table 3)

Table 3: obstetric distribution of culture positive cases

Obstetric formula	Total no. of patients	Bacterial detected	Percentage
Primigravidas	241	39	50%
Multigravidas	259	39	50%
Total	500	78	100%

In our study maximum number of culture positive cases were noted in second trimester (53%), followed next by third trimester (32%) and first trimester (15%) (Table 4)

Table 4: Trimester wise distribution of culture positive cases

Trimester	No. of positive culture cases	Percentage
First Trimester	12	15.0%
Second Trimester	41	53.0%
Third Trimester	25	32.0%
Total	78	100.0%

The commonest isolated organism was (*E. coli*) in 42 (54%) cases, followed by S.aureus in 14 (18%) cases, Coagulase Negative S.aureus in 11(14%) cases, Methicillin Resistant S.aureus in 7 (9%) cases, Klebsiella pneumonia in 3 (4%) cases, Enterococcus in 1 (1%) case of culture positive cases (Table 5)

Table 5: distribution of culture positive cases according to bacterial isolates

Name of Isolate	No. of cases	Percentage
E.coli	42	54.0%
S.aureus	14	18.0%
CoNS	11	14.0%
MRSA	7	9.0%
K.pneumonia	3	4.0%
Enterococcus	1	1.0%
Total	78	100.0%

In our study, different growth of organisms showed maximum sensitivity to antimicrobial drugs like NFT (65%), followed by gentamicin (63%), amikacin (46%) and norflox (10%).

Discussion

Urinary tract infections are common in females & much more common in pregnancy due to the morphological and physiological changes that takes place in the genitourinary tract during this period [5, 17] Asymptomatic bacteriuria of pregnancy needs special attention, due to lack of symptoms & its adverse consequences in pregnancy. A cost evaluation study reported that screening for pyelonephritis is appropriate when the prevalence of ASB is greater than 2% [7] An early detection and treatment of ASB may be of considerable importance not only to forestall acute pyelonephritis and chronic renal failure in the mother, but also to reduce the prematurity & fetal mortality in the offspring [18].

In our study, we found the prevalence of ASB to be 15.6% and so, screening all antenatal women for ASB, especially in early pregnancy by a quantitative urine culture is recommended. Incidence in studies conducted by Maryam Kasraeian et al, Vaishali et al and Ansari HQ *et al.* among pregnant women correlates with the present study [19, 20, 21]. This high prevalence is attributed to their socioeconomic status, lack of personal and environmental hygiene.

Overall, the incidence in various Indian studies was found to be between 5 & 12%, and in Western studies, the incidence ranges from 2-7%. [22, 23] In the present study, significant bacteriuria was found in 15.6% cases, which was almost similar to other studies. [23, 24, 25] There are not many studies on the incidence of ASB in India. In a study which was by Lavanya SV *et al.* [18], the incidence of ASB was 8.4% in a south Indian population. This may be due to stasis produced by gravid uterus, and since most (*E. coli*) strains prefer that environment, they cause UTI. Another reason could be as a result of poor genital hygiene practices by pregnant women who may find it difficult to clean their anus properly after defecating or to clean their genitals after passing urine [26, 27, 23] The early detection of ASB is essential for an early treatment and for the avoidance of complications.

Antenatal women in age group 21-25 years had highest percentage of culture positive cases (51%), followed by 26-30 years age (36%), followed next by 31-35 years (10%), followed next by <20 years (3%). Similar age pattern was also observed in other studies. [27, 28] The reason may be due to that, most women between 21-30 years age group may be multiparous, and multiparity is a risk factor for acquiring asymptomatic bacteriuria in pregnancy [27, 23].

In our study, most culture positive cases were seen in second trimester (53%), which was similar to Girishbabu R J study [26] and Nath et al study [6].

In the present study, prevalence of ASB was equal between primigravidas and multigravidas. It was slighlty more in primigravidas than multigravidas but it was not statistically significant. This is in contrast to study done by Okonko *et al.* [29]. which showed that majority of the women with ASB were multigravidas. The higher incidence of ASB in the multigravida is due to increased colonization of urinary tract by pathogens due to repeated exposure to urinary stasis or previous infections.

The gram negative bacteria were mainly responsible for asymptomatic bacteriuria. (*E. coli*) was commonly found in 42 cases (54%) in our study which is similar to different studies, where also (*E. coli*) was found to be the commonest isolate [23, 30, 7] other organisms found are S.aureus (18%) and Klebsiella pneumoniae (4%). In a study by Verma et al showed that E.coli was the most common isolate followed by Staphylococcus saprophyticus, which was believed to be normal commensal, was recognized as the second most common pathogen accounting to 16.68% [28, 31, 32].

In the present study antibacterial sensitivity of nitrofurantoin against (*E. coli*) was documented to be 65%. 50% strains of (*E. coli*) were susceptible to cefuroxime and amoxy-clavulinic acid combination. Overall nitrofurantoin was reported to be highly sensitive against all strains except pseudomonas. Whereas Jubaida et al concluded in their study that Escherichia coli was 86.4% sensitive to Nitrofurantoin, 38.6% to Ciprofloxacin and Ceftriaxone [33].

In our study Nitrofurantoin was found to be highly sensitive to most of the isolates. This finding well correlates with the other studies carried out in Bangladesh, Pakistan and Ghana. [31, 34, 35] Nitrofurantoin in pregnancy appeared to be safe and a survey on physicians confirmed that most practitioners adhered to recommend prescribing nitrofurantoin in pregnancy [36].

All patients with significant bacteriuria were advised to take appropriate antibiotics as per the sensitivity report.

Conclusion

Significant bacteriuria was present in 15.6% in this study. The most sensitive test for its detection is urine culture with clean-catch mid stream urine.Prevalence was maximum in 2nd trimester and in the age group of 21-25 years. Most common organism isolated was (*E. coli*) and the maximum sensitivity was towards Nitrofurantoin. Women with ASB may have serious consequences on both mother & child. Therefore, it is important to screen all antenatal women for asymptomatic bacteriuria at their first prenatal visit, preferably in first trimester, and those who are positive should be followed up closely after treatment because about 1/3rd will experience a recurrence. It's time that we have a look at this strategy for improving the healthcare and for reducing the maternal and fetal morbidity and mortality.

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