Asymptomatic Bacteriuria in Pregnancy: Prevalence & Diagnosis

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Abstract:
Introduction: Urinary tract infection (UTI) is one of the commonest infections occurring in the course of pregnancy. As Asymptomatic Bacteriuria (ASB) poses a major threat during pregnancy leading to both meternal and fetal adverse outcomes it has become necessary to diagnose and treat this infection at the earliest . This study was taken up to estimate the prevalence of ASB among pregnant women, common pathogens causing it and their antibiogram, and to device an ideal screening method for detection of bacteriuria.
Materiails and methods: 500 pregnant women attending the ANC of MGMCRI, Pondicherry, were taken up for the study in a period of 1 year. Written consent and a brief history was obtained from the study subjects. The urine sample was collected and sent to the Microbiology laboratory for processing. The sample was then subjected to a wet mount examination, Dipstick testing (A10REAGENT STRIPS, RAPHA) and urine culture on Blood agar plate and CLED agar plate. The observations were noted, the isolates were identified by preliminary tests and basic biochemical tests and antibiotic sensitivity testing was done for the necessary isolates.
Results & Conclusion: Prevalence of ASB among pregnant women was 9%. The ideal screening method for diagnosis of ASB was urinary leucocytes detection with the commonest uropathogen being Escherichia coli.

1. Introduction

Urinary tract infection (UTI) is one among the global health problems prevailing in almost all age groups. Significant bacteriuria is defined as, a urine sample containing more than 10^5 colonies/ml of urine (10^8/L) in pure culture using a standard calibrated bacteriological loop.[i] It is more common among females, young children, immunocompromised patients and is the commonest infection associated with pregnancy. UTI can present with a wide spectrum of symptoms ranging from mild irritative voiding to bacteraemia which could lead to sepsis and even death.[ii] Almost 23-75% of pregnant women counteract urinary tract infection in the course of their pregnancy.[iii,iv] This high prevalence could be attributed to the physiological changes in pregnancy and also the anatomical difference in the female urinary tract.

Anatomically, Urinary tract infections can be classified as upper (pyelonephritis and ureteritis) and lower urinary tract infections (cystitis and urethritis). Based on the mode of acquiring the infection, they are classified as community acquired, hospital acquired and miscellaneous causes. Based on the symptomatology, urinary tract infections accompanied by signs and symptoms related to the urinary tract with significant bacteriuria are called symptomatic urinary tract infections and those infections without signs and symptoms related to urinary tract, but with significant bacteriuria are termed asymptomatic urinary tract infections or asymptomatic bacteriuria (ASB).[v]

ASB is one of the commonest infective sequels in the course of pregnancy and has an increased risk of emerging into symptomatic urinary infection or recurrent asymptomatic bacteriuria during the course of pregnancy. On an average 8 to 45% of all women develop symptoms of UTI at some stage during their pregnancy.[vi,vii] The serious maternal complications like pyelonephritis, pre-eclampsia,

shock and even death and foetal outcomes like preterm birth, low birth weight, still-borne infants etc., following asymptomatic bacteriuria, makes it necessary for the early diagnosis and prompt management. The diagnosis of ASB was hindered, due to the absence of specific signs and symptoms pertaining to urinary tract infection, a combination of tests was needed to screen all pregnant women. Although urine culture is considered as gold standard test, it has long turn-around time. Several rapid screening tests are currently in use, but still the evidence of their efficacy is of poor quality. However, combinations of them have been reported to be a reliable alternative having sensitivity and specificity comparable to urine culture. The common isolates causing ASB have been reported *as Escherichia coli, Enterococcus and Klebsiella spp.*

In view of the potential importance of bacteriuria in pregnancy, the present study was undertaken to device the ideal screening method for ASB, by comparing the gold standard method of urine culture and the other rapid screening tests, and to identify the commonest isolate causing ASB in pregnancy as it may significantly improve the pregnancy outcomes.

2. Materials and methods:

The study was conducted with a total of 500 pregnant women, irrespective of their presenting complaints, in all the three trimesters attending the antenatal clinic of the Department of Obstetrics and Gynaecology at Mahatma Gandhi Medical College and Research Institute, Pondicherry. Patients on antibiotics and catheterised patients were excluded from the study. A brief history of presenting illness, obstetric history and personal history were taken from the patient and the patients were instructed about the method to collect the urine sample. 5ml urine sample was then collected under strict aseptic precautions and transported at the earliest to the Microbiology lab in the Department of Microbiology, Mahatma Gandhi Medical College and Research Institute, Pondicherry for processing and identification. The sample was first subjected to a wet mount examination (for the presence of pus cells, epithelial cells and organisms), followed by a commercially available Dipstick testing (A10 Dipsticks, RAPHA- for detection of urinary leucocytes and urinary nitrites) and finally subjected to the routine urine culture on CLED agar (HIMEDIA) and 5% sheep blood agar(HIMEDIA) by inoculating with a calibrated loop and incubated at $37^{o}C$ for 24hrs. Any growth if present, was then identified by routine preliminary tests (Grams staining, Catalase test, Oxidase test and Motility) and biochemical tests (Indole test, Citrate utilisation test, Urease test and Kligler iron agar test). An antibiogram was also put up for the identified isolates on Muller Hilton agar with controls (ATCC Escherichia coli 25922 and ATCC Staphylococcus aureus 25923) and the zone sizes were interpreted by comparing with the CLSI standard charts.[viii]
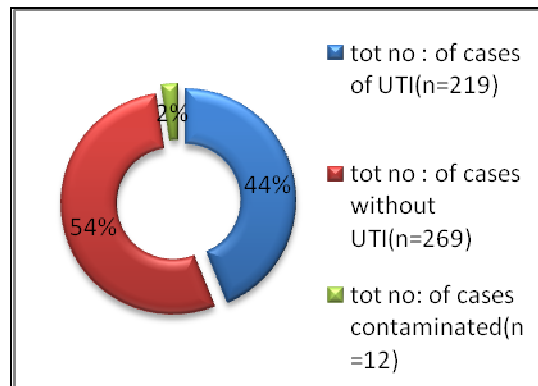
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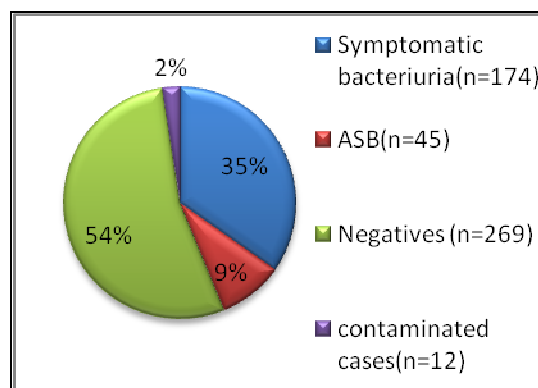

Figure 1: Prevalence of UTI

Figure 2: Prevalence of ASB

Of the 500 pregnant women taken up in the study, 219 (44%) cases were positive for urinary tract infection. Among the positive cases, 45 (9%) patients had ASB. The prevalence of ASB was highest among pregnant women of the age group between 21-25 yrs (48.8%), followed by the age group between 26-30 yrs (40%). The prevalence of ASB was highest among the primigravida compared to multigravida. Urine culture (100%) remains the gold standard for the diagnosis of urinary tract infection, along with detection of urinary leucocytes (100%) which was also found to be equally effective.

Escherichia coli (80%) was found to be the predominant pathogen causing ASB in pregnancy, followed by Enterococcus, Klebsiella spp, Non fermenting gram negative bacilli and Staphylooccus. Amikacin, Imipenem Nitrofurantoin and Norfloxacin were found to be sensitive in more number of cases when compared to the other urinary system specific antibiotics.

Age groups (years)	Prevalence (%)
≤20	6.6
21-25	48.8
26-30	40
>30	4.4

Table 1: Age group distribution

Gravida	Prevalence (%)
Primi	62.2
Multi	37.8

Table 2: Prevalence among primi and multigravida

Method	Percentage of positives
Wet mount	37.7
Leucocytes detection	100
Nitrite detection	88.8
Urine Culture	100

Table 3: Comparision of methods to detect ASB

Organism	Prevalence (%)
E.coli	80
Enterococcus	8.8
Klebsiella spp	6.6
Non fermenting gram negative bacilli	2.2
Staphylococcus	2.2

Table 4: Common uropathogens causing ASB

Drug	Sensitivity (%)
AK	55.5
CIP	40
COT	49
CTX	40
GEN	35.5
IPM	53
NA	33
NIT	47
NX	42

Table 5: Antibiogram of the common uropathogens causing ASB

4. Discussion

The high prevalence of UTI in pregnancy (62%) in females in the age group of 21-25yrs in our study, which is in contrast to other studies in which the prevalence is high in the age group of 26-30yrs.[vii,ix,x]This could be attributed to the high sexual activity or higher prevalence of anaemia among these groups.[xi]

Majority of the studies show a higher prevalence of UTI in multigravida and stress on the fact that the prevalence of UTI in pregnancy increases with parity.[iv,xii,xiii]In contrast to this, it was found that, the prevalence of UTI associated with pregnancy was higher among the primigravida by Marahattaet al [xiv] and Lavanyaet al [xv]whichis similar to the findings in our study.

The prevalence of ASB in pregnancy seems to be higher among the western population when compared with the Indian population.[ix,x,xvi, xvii, xviii] Our study results compare very well with the other south Indian studies in having a lower prevalence of ASB of 9%.[xvii, xviii] This could possibly due to the increasing educational levels and improvement in hygiene in south Indian women.

Urinary nitrite detection has been reported by many researchers as an ideal screening method for detecting pregnancy associated ASB. This is in contrast to our study. In our study detection of urinary leucocytes has been an ideal screening method for detecting pregnancy associated ASB, which has already been quoted by Jido TA [xix]in a similar study in Nigeria. The percentage of positives by the detection of leucocyte was 100% and the percentage of positives by detection of urinary nitrites was 88.8%. This could be due to the variability in the kit manufacturer, the timing used to read the results may vary between manufacturers, the time delay in the appearance of nitrites in the urine giving false negatives, delay in sample processing and technical errors. Furthermore in all the studies quoted above, Urine culture for detection of urinary tract infection remained the gold standard for diagnosis of ASB in pregnancy.

In both Indian as well as in Western studies Escherichia coli has been reported as the most predominant uropathogen causing ASB in pregnancy followed by Staphylococcus, Klebsiella spp and Enterococcus. Rarely Staphylococcus is the most predominant pathogen to cause UTI, which may be because of improper sample collection. In our study Enterococcus emerged as the third most common isolate, following Escherichia coli and Klebsiella spp. This may be attributed to the ablution practices following defecation in women. Escherichia coli, the commonest uropathogen in various studies and also in our study had a varied antibiogram. 55.5% of isolates were sensitive to Amikacin, 53% sensitive to Imipenem, 47% sensitive to Nitrofurantoin, 42% sensitive to Norfloxacin, 40% sensitive to Ceftriaxone, and 33% sensitive to Nalidixic acid.. However, on account of teratogenicity of Amikacin and Imipenem, we recommend Nitrofurantoin or Norfloxacin as the drug of choice for empirical therapy in pregnant women.

5. References

i. Cheesebrough M(2005). District tropical disease laboratory. 2^nd^ed:Cambridge University Press.
ii. Kalra OP, Raizada A(2009). Approach to a patient with urosepsis. J Glob Infect Dis,1(1),57-63.
iii. Adabara NU, Momoh JA, Bala JD, Abdulrahman AA, Abubakar MB (2012). The prevalence of bacterial urinary tract infections (UTI) among women attending antenatal clinic in the general hospital, Minna in Niger state. IJBR, 3(3), 171-173.
iv. Mokube MN, Atashili J, Halle-Ekane GE, Ikomey GM, Ndumbe PM (2013). Bacteriuria amongst pregnant women in the Buea hospital district,Cameroon: Prevalence, predictors, antibiotic susceptibility patterns and diagnosis. PLoS ONE, 8(8),e71086.
v. Tille PM(2013) . Bailey and Scotts's Diagnostic Microbiology. 13^th^ed:Elsevier.
vi. Schnarr J, Smaill F (2008). Asymptomatic bacteriuria and symptomatic urinary tract infections in pregnancy. Eur J Clin Invest ,38(S2),50-7.
vii. Imade PE, Izekor PE, Eghafona NO, Enabulele OI, Ophori E (2010). Asymptomatic bacteriuria among pregnant women. North Am J Med Sci, 2, 263-6.
viii. CLSI (2013). Performance standard for antimicrobial susceptibility testing; twenty third informational supplement. CLSI document M100 S23:Clinical and Laboratory Standards Institute.
ix. Ajayi AB, Nwabuisi C, Aboyeji AP, Ajayi NS, Fowotade A, Fakeye OO (2012). Asymptomatic bacteriuria in antenatal patients in Ilorin, Nigeria. Oman Med J, 27(1), 31-35.
x. Kehinde AO, Adedapo KS, Aimaikhu CO, Odukogbe AO,Olayemi O, Salako B (2011). Significant bacteriuria among asymptomatic antenatal clinic attendees in Ibadan,Nigeria. Trop Med Health, 39(3), 73-76.
xi. Dutta DC (2008). DC Dutta's textbook of Obstetrics and Gynecology. 6^th^ed:New central book agency.
xii. Turpin CA, Minkah B, Danso KA, Frimpong EH (2007). Asymptomatic bacteriuria in pregnant women attending antenatal clinic at Komfo Anokye teaching hospital,Kumasi,Ghana. Ghana Med J, 41,26-9.
xiii. Andabati G, Byamugisha J (2010). Microbial aetiology and sensitivity of asymptomatic bacteriuria among ante-natal mothers in Mulago hospital, ganda. Afr Health Sci,10(4), 349-352.
xiv. Marahatta R,Dhungel BA, Pradhan P, Rai SK, Choudhury DR (2011). Asymptomatic Bacteriuria among pregnant women visiting Nepal medical college teaching hospital, Kathmandu, Nepal. Nepal Med Coll J, 13(2), 107-110.
xv. Lavanya S V, Jogalakshmi D (2002). Asymptomatic bacteriuria in antenatal women. Indian J Med Microbiol, 20,105-6.
xvi. Lumbiganon P, Chongsomchai C, Chumworathayee B, Thinkhamrop J. reagent strip testing is not sensitive for the screening of asymptomatic bacteriuria in pregnant women. J Med Assoc Thai, 85,922-27.
xvii. Jayalakshmi J, Jayaram VS (2008). Evaluation of various screening tests to detect asymptomatic bacteriuria in pregnant women. Indian J PatholMicrobiol, 51(3).
xviii. Lata CR, Anil K, Kamlesh T, Kiran MK, Anuradha S, Smriti C (2012). Prevalence of pregnancy associated asymptomatic bacteriuria:a study done in a tertiary care hospital. J ObstetGynecol India, 62(5),511-514.
xix. Jido TA. Urinary tract infections in pregnancy: Evaluation of diagnostic framework. Saudi J Kidney Dis Transpl, 25(1),85-90.