Original Research Paper Urology

PREVALENCE OF ASYMPTOMATIC BACTERIURIA IN PREGNANCY IN A TERTIARY CARE HOSPITAL OF EASTERN PART OF INDIA

Dr Sahina Hassan	Residents, IMS & SUM Hospital,Siskha O Anusandhan university, Bhubaneswar, Odisha
Dr Rajashree Panigrahy*	Assoc prof of dept of Microbiology, IMS & SUM Hospital,Siskha O Anusandhan university, Bhubaneswar, Odisha *Corresponding Author
Dr Suren Kumar Das	Prof & HOD of Urology, IMS & SUM Hospital,Siskha O Anusandhan university, Bhubaneswar, Odisha
Dr Smita Padhy	Residents, IMS & SUM Hospital,Siskha O Anusandhan university, Bhubaneswar, Odisha

ABSTRACT

Women are more susceptible to infections due to the hormonal and physiological changes during pregnancy. Hydroureter of pregnancy begins in the first trimester and progresses until term, returning to normal within several weeks after delivery in most women. Dilatation of the renal pelvis along with elongation and dilatation of the ureters above the pelvic brim occurs due to lack of smooth muscle tone caused by increased levels of circulating progesterone in early weeks of pregnancy and due to the compression of ureters by the growing uterus, thus promoting retention of urine in the later weeks of pregnancy. Dilated ureters may contain more than 200ml of urine and contribute to the persistence of bacteriuria in pregnancy. In addition, glycosuria and aminoaciduria in pregnancy provide an excellent culture medium for bacteria in areas of urine stasis. Decreased ureteral peristalsis after the 2nd month with long periods of complete atony in the 7th and 8th months of pregnancy occurs under the influence of hormones. Augmentation of urinary reflux to the upper urinary tract is also a result of hormonal changes. Later in the course of pregnancy, increased bladder capacity and longer kidney length may contribute to the development of symptomatic infection.

Asymptomatic bacteriuria during pregnancy is a common cause of serious maternal and perinatal morbidity; with appropriate screening and treatment, this morbidity can be limited. Hence in the present study, an attempt was made to evaluate two rapid screening methods and semi quantitative urine culture by standard loop method for detection of ASB in antenatal cases. In our study out of 700 cases, 58 cases were found to have asymptomatic bacteriuria (8.3%).

KEYWORDS : Asymptomatic bacteriuria, pregnancy

Introduction

Urinary tract infections are a common occurrence during pregnancy due to the morphological and physiological changes in genitourinary tract associated with pregnancy. Urinary tract infections in pregnancy may either be symptomatic or asymptomatic.

Asymptomatic bacteriuria (ASB) in pregnancy 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.[1]

The prevalence of asymptomatic bacteriuria is about 2 to 10% in pregnant women.[1,2] It has been clearly established that untreated bacteriuria can have serious implications for both mother and foetus. It is implicated as a risk factor for adverse perinatal outcomes like premature birth, low birth weight and perinatal death. In addition, an association has been documented between antepartum urinary tract infection and a variety of maternal complications of pregnancy including hypertension, pre-eclampsia, anaemia, amnionitis and endometritis.[3]

The relative high prevalence of asymptomatic bacteriuria during pregnancy, the significant consequences for the pregnancy, plus the ability to avoid sequelae with treatment, justify screening pregnant women for bacteriuria.[4] Screening for asymptomatic bacteriuria is a standard of obstetrical care and is included in most antenatal guidelines. While several rapid screening tests have been evaluated, none perform adequately to replace urine culture for detecting asymptomatic bacteriuria.[5] Thus, urine culture remains the gold standard screening technique for asymptomatic bacteriuria in pregnancy.[6,7] Considering the above factors, the present study was undertaken to determine the current prevalence of asymptomatic bacteriuria among obstetric patients in this tertiary care hospital, identify bacterial pathogens responsible for the condition and evaluate their antimicrobial susceptibility pattern.

Aims and Objectives

1. To detect the prevalence of asymptomatic bacteriuria in pregnancy by various screening tests (Urine culture, Gram's stain and pus cell count).
2. To compare the sensitivity and specificity of the above screening tests with that of urine culture.
3. To identify common pathogens causing asymptomatic bacteriuria.
4. To determine the antimicrobial susceptibility pattern of different bacterial species isolated in asymptomatic bacteriuria.

Material & Methods

A total of 700 cases of urine samples from asymptomatic pregnant women were collected fulfilling the exclusion and inclusion criteria, visiting the inpatient and outpatient department of Obstetrics and Gynaecology of our institute, for the study. Institutional approval and approval from the Institutional Ethics Committee was taken prior to the study.

Inclusion criteria:

1) All pregnant Women without the symptoms of urinary tract infection.
2) Pregnant women without antibiotic treatment (for any cause).

Exclusion criteria:

1) History of urinary tract infection symptoms (dysuria, frequency and urgency, etc).
2) Pregnancy induced Diabetes Mellitus/Hypertension
3) History of antibiotic therapy in the previous two weeks.
4) Pyrexia and
5) Known congenital anomalies of the urinary tract.

After proper collection of the sample ,it was inoculated in CLED medium and the isolated organism was identified by standard identification procedure[8,9] and appropriate antibiotic susceptibility test was done by using CLSI guibelines [10].

Observation

A total of 700 women of any gestational age who attended the Obstetrics and Gynaecology department were screened for ASB.

Table No. 1: Results of culture

Culture results	No. of cultures	Percentage
Significant bacteriuria (≥ 105cfu/ml)	58	8.3%
Insignificant bacteriuria (< 105cfu/ml)	36	5.1%
No growth (sterile)	606	86.6%
Total	700	100%

Out of 700 cases, 58 cases showed significant bacteriuria and 36 cases showed insignificant bacteriuria and were not included in the count for ASB. Thus out of 700 cases, 58 cases (8.3%) had significant bacteriuria, 36 cases (5.1%) had insignificant bacteriuria and no growth was observed in 606 cases (86.6%).

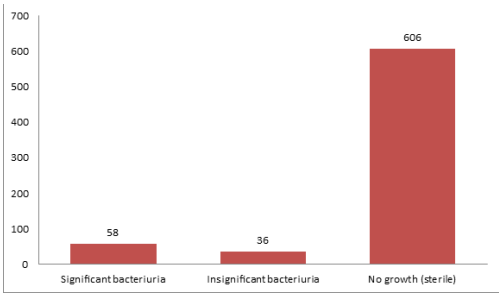

Diagram showing Results of culture

Table No. 2: Prevalence rate of ASB with respect to age.

Age (Yrs.)	No. of subjects	No. of infected
18-20	192 (27.4%)	14 (7.3%)
21-30	478 (68.3%)	42 (8.8%)
31-40	30 (4.3%)	02 (6.7%)
Total	700	58 (8.3%)

Out of 700 cases, 192 (27.4%) cases were in age group 18 to 20 years, 478 (68.3%) cases were in age group 21 to 30 years and 30 cases (6.7%) were between 31 to 40 years age group.

The percentage of culture positivity with significant bacteriuria was highest in age group 21-30 years (8.8%), followed by 7.3% and 6.7% in 18 to 20 and 31 to 40 years age group respectively.

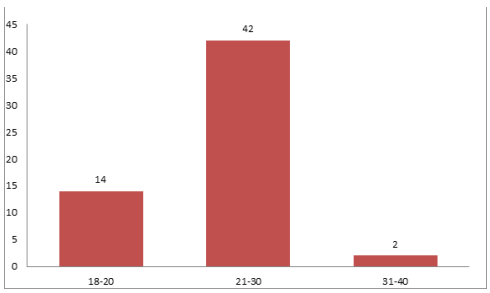

Diagram showing Prevalence rate of ASB with respect to age

Table No. 3: Culture positivity with significant bacteriuria in different gravida

Gravida	No. of subjects screened	No. of positive cultures with Significant bacteriuria (n=)
Primigravida	383 (54.7%)	43 (11.2%)
Multigravida	317 (45.3%)	15 (4.7%)
Total	700	58 (8.3%)

Out of 700 cases, 383 cases (54.7%) were primigravida, 317 cases (45.3%) were multigravida.

The percentage of culture positivity with significant bacteriuria was more in primigravida i.e. 43 (11.2%), followed by multigravida 15 (4.7%).

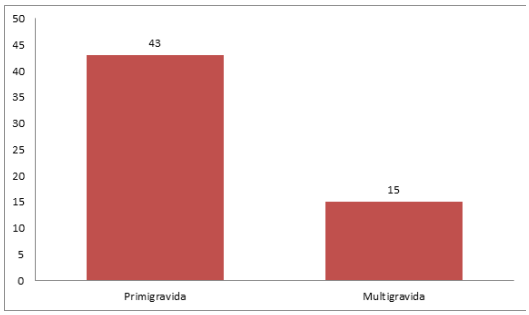

Diagram showing culture positivity with significant bacteriuria indifferent gravid

Table No. 4: Culture positivity with significant bacteriuria in different trimesters

Trimester	No. of subjects	No. of culture positive
1st Trimester	114 (16.3%)	11 (9.6%)
2nd Trimester	271 (38.7%)	21 (7.7%)
3rd Trimester	315 (55.0%)	34 (10.8%)
Total	700	58

Out of 700 cases, 315 cases (55.0%) belonged to 3rd trimester, 271 cases (38.7%) belonged to 2nd trimester and 114 cases (16.3%) belonged to 1st trimester. The percentage of culture positivity with significant bacteriuria was more in 3rd trimester i.e. 34 (10.8%), followed by 1st trimester 11 (9.6%) and 2nd trimester 21 (7.7%).

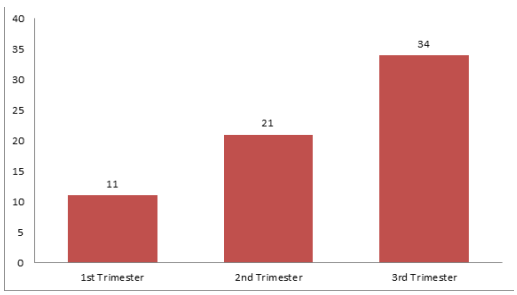

Diagram showing culture positivity with significant bacteriuria in different trimesters

Table no.5: Comparison of pus cell count with urine culture

Urine Culture	Pus cells	
	Positive	Negative
Culture positive	26 (TP)	32 (FN)
Culture negative	57 (FP)	585 (TN)

(TP=true positive, FP=false positive, FN=false negative, TN=true negative)

While comparing the results of pus cell count with respect to urine culture, it was observed that 26 were true positive, 32 were false negative, 57 were false positive and 585 were true negative. Thus the resulting sensitivity, specificity, PPV, NPV for pus cell count are 31.33%, 94.81%, 44.83% and 91.12% respectively (Table No. 7).

Table No. 6: Comparison of gram stain with urine culture

Urine Culture	Gram stain	
	Positive	Negative
Culture positive	54(TP)	04(FN)
Culture negative	10(FP)	632(TN)

(TP=true positive, FP=false positive, FN=false negative, TN=true negative)

While comparing the results of gram stain with respect to urine culture, it was observed that 54 were true positive, 4 were false negative, 10 were false positive and 632 were true negative. Thus the resulting sensitivity, specificity, PPV, NPV for gram stain are 84.38%, 99.37%, 93.10% and 98.44% respectively (Table No. 7).

Table no. 7: Distribution of statistical values of gram stain and pus cell count

Test	Sensitivity	Specificity	PPV	NPV
Gram's stain	84.38%	99.37%	93.10%	98.44%
Pus cell count	31.33%	94.81%	44.83%	91.12%

(PPV=Positive predictive value, NPV=Negative predictive value)

Out of the two rapid screening methods, gram stain showed a high sensitivity and specificity as compared to pus cell count.

Table No. 8: Organisms isolated in this study

Organism	No. of organism	Percentage
E. coli	38	65.5%
K. pneumonia	10	17.2%
S. aureus	09	15.5%
Enterococci	01	02.8%
Total	58	100.0%

The commonest organism isolated was *Escherichia coli* 38 (65.5%), followed by *Klebsiella pneumoniae* 10 (17.2%), Staphylococcus *aureus* 9 (15.5%) and *Enterococci* 1 (2.8%).

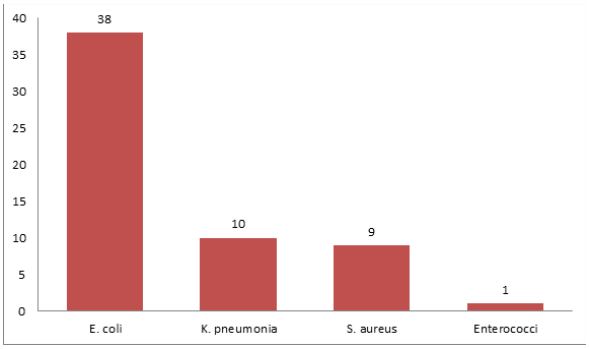

Diagram showing organisms isolated

Table No. 9: Antibiotic susceptibility to Gram negative bacterial isolates

Organism	No. of organism	AK No. (%)		AMC No. (%)		CFM No. (%)		COT No. (%)		NIT No. (%)		PIT No. (%)		LE No. (%)	
		S	R	S	R	S	R	S	R	S	R	S	R	S	R
E. coli	38	29 (76.3)	09 (23.7)	11 (28.9)	27 (71.1)	25 (65.8)	13 (34.2)	26 (68)	12 (32)	32 (84.2)	06 (15.8)	25 (65.8)	13 (34.2)	34 (89.5)	04 (10.5)
K. pneumonia	10	7 (70)	3 (30)	0 (0)	10(100)	06 (60)	04 (40)	8 (80)	02 (20)	02 (20)	08 (80)	03 (30)	07 (70)	09 (90)	01 (10)
Total	48	36 (75)	12 (25)	11 (22.9)	37 (77.1)	31 (64.6)	17 (35.4)	34 (70.8)	14 (29.1)	34 (70.8)	14 (29.2)	28 (58.3)	20 (41.7)	43 (89.6)	05 (10.4)

S=Sensitive, R=Resistant, COT=Cotrimoxazole, NIT—Nitrofurantoin, LE=Levofloxacin, PIT=Pipercillin+Tazobactam, CFM=Cefixime AMC=Amoxycillin+ clavulanic acid, AK=Amikacin

Out of 48 gram negative isolates, 43 isolates were sensitive to levofloxacin (89.6%), amikacin 36 (75.0%), nitrofurantoin 34 (70.8%), cotrimoxazole 34 (70.8%), cefixime 31 (64.6%) and to piperacillin/tazobactam 28 (58.3%).

37 (77.1%) isolates were resistant to Amoxicillin-Clavulanic acid.

Table No. 10: Antibiotic susceptibility to Gram positive bacterial isolates

Organism	No. of organism	AK No. (%)		AMC No. (%)		CTR No. (%)		GN No. (%)		LZ No. (%)		OX No. (%)		OF No. (%)	
		S	R	S	R	S	R	S	R	S	R	S	R	S	R
S. aureus	09	0 (0)	9 (100)	4 (44.4)	5 (55.6)	8 (88.9)	1 (11.1)	4 (44.4)	5 (55.6)	7 (77.8)	2 (22.2)	6 (66.7)	3 (33.3)	7 (77.8)	2 (22.2)

S=Sensitive, R=Resistant, OF=Ofloxacin, LZ=Linezolid, AMC= Amoxicillin+clavulanic acid, AK=Amikacin, GN=Gentamicin, OX=Oxacillin, CTR=Ceftriaxone

Out of 9 Gram positive, 8 isolates were sensitive to ceftriaxone (88.8%), ofloxacin 7 (77.8%), linezolid 7 (77.8%) and to oxacillin 6 (66.7%).

9 isolates were resistant to amikacin (100.0%) and 5 each to amoxicillin-clavulanic acid (55.5%) and gentamicin (55.5%).

Table No. 11: Antibiotic susceptibility to Gram positive bacterial isolates

Organism	No. of organism	AK No. (%)		AMC No. (%)		VA No. (%)		L No. (%)		LZ No. (%)		LE No. (%)		COT No. (%)		OF No. (%)	
		S	R	S	R	S	R	S	R	S	R	S	R	S	R	S	R
E. fecalis	01	0 (0)	1 (100)	0 (0)	1 (100)	1 (100)	0 (0)	0 (0)	1 (100)	1 (100)	0 (0)	0 (0)	1 (100)	0 (0)	1 (100)	1 (100)	0 (0)

S=Sensitive, R=Resistant, LE=Levofloxacin, OF=Ofloxacin, LZ=Linezolid, COT=Cotrimoxazole AMC=Amoxycillin+clavulanic acid, AK=Amikacin, L=Lincomycin, VA=Vancomycin

The one isolate of *E. faecalis* is sensitive to vancomycin, linezolid and ofloxacin. It is resistant to amikacin, amoxicillin-clavulanic acid, lincomycin, levofloxacin and cotrimoxazole.

Summary

The present study was carried out during a period from November 2014 to September 2016 in the Department of Microbiology of our institute.

This study was undertaken to determine the prevalence of asymptomatic bacteriuria in pregnant women in our hospital and to evaluate which among the screening test was good for detection of ASB. Antibiotic sensitivity was done for the isolated organisms for administration of appropriate antibiotics to the patients. To summarize the results:

- The prevalence of ASB in the present study was 8.3%.
- Maximum (8.8%) cases were between 21-30 years age.
- 11.2% were primigravida and 4.7 % were multigravida in the present study.
- In the present study ASB was more prevalent in 3rd trimester 34

cases (10.8%), 1st trimester 11 cases (9.6%) and 2nd trimester 21 cases (7.7%).

- Most predominant organism isolated was *E. coli* (65.5%) followed *by Klebsiella species* (17.2%).
- Among the two rapid screening methods, Gram stain of uncentrifuged urine showed the highest sensitivity (84.38%), followed by urine wet mount for pus cells (31.33%).
- Gram stain showed highest specificity (99.37%), followed by urine wet mount for pus cells (94.81%).
- Standard loop method for urine culture showed a sensitivity of 100% and specificity of 100%.
- Gram negative bacilli were sensitive to levofloxacin (89.6%), amikacin (75.0%), nitrofurantoin (70.8%), cotrimoxazole (70.8%), cefixime (64.6%) and to piperacillin/tazobactam (58.3%).
- Gram positive cocci were sensitive to ceftriaxone (88.8%), ofloxacin (77.8%), linezolid (77.8%) and to oxacillin (66.7%).

Conclusion

To conclude, given the potential sequelae of undiagnosed ASB in the obstetric population, we suggest that all pregnant women should be screened for ASB. The ideal screening test should correctly identify the negative samples, i.e. one with high sensitivity and with reasonably good specificity. Other factors include accuracy, ease of test performance, reproducibility and turnaround time. Gram staining of uncentrifuged urine was found to be the most useful, reliable, cost effective and rapid test. It can only be an alternative option in peripheral centers where facilities for culture are not available. Culture was taken as a gold standard against which the screening methods were compared. Pregnant women should be screened for asymptomatic bacteriuria in all the three trimesters to prevent the complications which are associated with ASB.In view of the drug resistance, therapy should be advocated as far as possible after culture and sensitivity has been performed. This would not only help in the proper treatment of the pregnant women, but would also discourage the indiscriminate use of the antibiotics.

References

1. Jayalakshmi J, Jayaram VS. Evaluation of various screening tests to detect asymptomatic bacteriuria in pregnant women. Indian J Pathol Microbiol 2008;51(3):379-381.
2. Kacmaz B, Cakir O, Aksoy A, Biri A. Evaluation of rapid urine screening Tests to detect asymptomatic bacteriuria in pregnancy. Jpn J Infect Dis 2006;59(4):261-2633.
3. Bandyopadhyay S, Thakur JS, Ray P, Kumar R. High prevalence of bacteriuria in pregnancy and its screening methods in North India. J Indian Med Assoc 2005 May; 103(5) :9.
4. Delzell JE, Lefevre ML. Urinary tract infection during pregnancy. Am Fam Phys 2000; 61:713-21.
5. Smaill F.Asymptomatic bacteriuria in pregnancy. Best practice and research clinical Obsterics and gynecology 2007;21(3):439-450.
6. Gayathree L, Shetty S, Deshpande SR,Venkatesha DT. Screening for asymptomatic bacteriuria in pregnancy: An evaluation of screening tests at the Hassan district hospital, India. J Clin DiagRes 2010 Aug;4:2702-2706.
7. Patterson TF, Andrriole VT. Bacteriuria in pregnancy. Infect Dis Clin North A 1987;1:807-822.
8. Konemans color Atals and Textbook of diagnostic microbiology. 6th edi. Edr. Washington CW, Allen SD, J and WM, Roneman EW, Procop GW, Schrecken Berger PC, Woods GL, Lippincortt Williams & Wilkins. Baltimore 2006.
9. Collee JG, Duguid JP, Fraser AG, Marmion BP, Simmons A. Laboratory strategy in the diagnosis of infective syndromes. In Collee JG, Marmion BP, Fraser AG, Simmons A. Editors. Mackie and McCartray practical medical microbiology. 14th edition. New York: Churchill Livingstone; 1996 Pg. 53-94.
10. Clinical and laboratory standard institu,2014 perfomance standard of antimicrobial susceptibility testing: Twenty fourth informational supplement: Approved standards M100-S24:Clinical & Laboratory standard institute ,Baltimore ,USA.