10.5005/jp-journals-10006-1411

ORIGINAL ARTICLE

Screening and Analysis of Asymptomatic Bacteriuria during Pregnancy

[1]Arshia Javed, [2]Aisha S Wali, [3]Zahra Hoodbhoy

ABSTRACT

Aim: Asymptomatic bacteriuria (ASB) is a common condition in pregnancy. The aim of our study is to estimate the rate of ASB, causative organisms, and antibiotic sensitivity in a secondary care hospital.

Materials and methods: Midstream clean catch urinary sample was collected from 149 women between 12 and 28 weeks of gestation. Those with urinary symptoms, diagnosed for urinary tract infection (UTI), with vaginal bleeding or vaginal discharge, and who had given antibiotics within 7 days preceding sample collection were excluded. Data were collected from medical records, and statistical analysis was done using Statistical Package for the Social Sciences (SPSS) version 19.

Results: Asymptomatic bacteriuria was seen in 26% (n = 39) of the women. No association of age, parity, gestational age, body mass index (BMI), and diabetes was found with ASB. The most common pathogen isolated was *Escherichia coli* (46%) followed by *Streptococcus* (17.9%) and *Staphylococcus aureus* (10.3%). Fosfomycin with 94.4% sensitivity and nitrofurantoin with 89% sensitivity were seen as first- and second-line antibiotics for treatment of *E. coli*. Overall sensitivity of all isolates was 69.20% for fosfomycin, 66.6% for ceftriaxone, and 61% for augmentin. The three most common antibiotics (i.e., penicillin, pipemidic acid, and ampicillin) used in pregnancy showed highest overall resistance for all isolates.

Conclusion: Incidence of ASB was significantly high. The most common bacteria isolated was *E. coli*.

Clinical significance: Due to large variance in prevalence worldwide, incidences should be studied in local population and antibiotics should be prescribed according to culture and sensitivity to address the issue of multidrug resistance.

Keywords: Asymptomatic bacteriuria, Cross-sectional study, Pregnancy.

How to cite this article: Javed A, Wali AS, Hoodbhoy Z. Screening and Analysis of Asymptomatic Bacteriuria during Pregnancy. J South Asian Feder Obst Gynae 2016;8(3):171-174.

Source of support: Nil

Conflict of interest: None

[1]Senior Instructor, [2]Assistant Professor, [3]Senior Instructor Research

[1-3]Department of Obstetrics and Gynaecology, The Aga Khan University, Sindh, Pakistan

Corresponding Author: Arshia Javed, Senior Instructor Department of Obstetrics and Gynaecology, The Aga Khan University, Sindh, Pakistan, Phone: +923002119180, e-mail: drarshiajaved@yahoo.com

Date of received: 7 April 2016

Date of acceptance: 16 May 2016

Date of publication: July 2016

INTRODUCTION

Urinary tract infection (UTI) is one of the most common bacterial infections in pregnancy and one of the most common causes of obstetrical admission apart from delivery.[1,2] Not all UTIs are symptomatic and therefore remain undetected. Symptomatic or asymptomatic, untreated UTI is associated with maternal and perinatal morbidity and mortality. Maternal complications include subsequent pyelonephritis, sepsis, shock, transient renal failure, miscarriage, anemia, preeclampsia, preterm labor, endometritis, and perpetual pyrexia. Perinatal complications are intrauterine growth restriction, low birth weight, prematurity, and neonatal sepsis, all contributing to perinatal mortality.[3] Therefore, the screening for asymptomatic bacteriuria (ASB) has now become a part of standard obstetric care, and most of the antenatal care guidelines, for example, the National Institute for Clinical Excellence, have included it.[4-6] In our part of the world, awareness about this condition is lacking, and most of the hospitals do not have guidelines regarding screening for ASB. Literature reports prevalence of ASB to be 2 to 10%.[7] It is defined as true bacteriuria in the absence of specific symptoms of acute UTI; detection of $>10^5$ cfu/mL of bacteriuria in single voided midstream urine is a practical alternative to gold standard urine culture for screening of ASB.[7,8]

In our hospital, urinary symptoms and UTI-associated morbidity in pregnancy were frequently encountered during both antenatal and postnatal period.

The objective of our study is to screen for ASB to observe its incidence in our unit and analyze for causative organisms and antibiotic sensitivity.

MATERIALS AND METHODS

A cross-sectional study was conducted from May 2014 to May 2015 in the Aga Khan Hospital for Women, Garden, which is a secondary care center of the Aga Khan University Hospital and Medical College Foundation, Karachi. Exemption for this observational study was obtained from the Ethical Review Committee of the

Aga Khan University Hospital as it was only a medical record review, with no direct interaction with women. All women attending the antenatal clinic between 12 and 28 weeks of gestation were included in the study, and those with urinary symptoms, diagnosed for UTI, having vaginal bleeding or vaginal discharge, or those who had given antibiotics within 7 days preceding sample collection were excluded.

The sample size in this study was calculated to estimate the ASB among pregnant women, using 3.6% prevalence as reported by a previous study.[9] This provided a maximum sample size of 149, with 95% level of confidence and 3% error estimation.

Women were explained the standard method of collection of midstream clean catch urine sample by the clinic nursing staff. The sample was collected in the laboratory in a sterile wide mouth container with tightly covered lid and submitted for culture and sensitivity at the same time. Data were collected from the medical records. Information pertaining to identity was not recorded to maintain confidentiality.

All manual data were entered in Statistical Package for the Social Sciences (SPSS). Statistical analysis was done by using SPSS version 19. To evaluate the various risk factors associated with ASB, chi-square test was carried out. All p-values were based on two-sided tests, and significance was set at $p < 0.05$.

RESULTS

The total number of participants in this study was 149; 39 (26%) of them had ASB. Table 1 shows the demographics and presence of diabetes mellitus in both the groups. No association of age, parity, gestational age, and body mass index (BMI) was found with ASB in this study.

Table 2 illustrates the type of organism isolated, with *E. coli* being the most common (46%) followed by *streptococcus* (17.9%). Less frequent isolates were *Staphylococcus* (10.3%), *Klebsiella* and *Enterococcus* (7.7% each), and *Pseudomonas* and *Citrobacter* (5.1% each).

Table 3 illustrates the sensitivity pattern of the isolated bacteria. *Escherichia coli*, the most prevalent bacteria, showed 100% resistance to penicillin and only 27% sensitivity to ampicillin and 33% sensitivity to pipemidic acid, the three commonly used antibiotics in pregnancy.

Table 1: Maternal characteristics

Maternal characteristics	*ASB present, n (%)*	*ASB absent, n (%)*	*p-value*
Age in years			
17–25	20 (51.3)	57 (51.8)	
26–34	17 (43.6)	47 (42.7)	0.66
≥35	02 (5.1)	06 (5.5)	
Parity			
Primipara	16 (41)	44 (40)	
Multipara (2–4)	22 (56.4)	63 (57.3)	0.99
Grand multipara (≥ 5)	01 (2.6)	03 (2.7)	
Gestational age in weeks			
12–19	22 (56.4)	65 (59.1)	0.93
20–28	17 (43.6)	45 (40.9)	
BMI			
<18.5	01 (2.6)	11 (10)	
18.5–22.9	10 (25.6)	38 (34.5)	0.74
23–27.5	20 (51.3)	35 (31.8)	
>27.5	08 (20.5)	26 (23.6)	
Diabetes mellitus	07 (17.9)	14 (12.7)	0.42

Table 2: Organisms isolated

Organism isolated	*n (%)*
Escherichia coli	18 (46.2)
Streptococcus	7 (17.9)
Staphylococcus	4 (10.3)
Citrobacter	2 (5.1)
Klebsiella	3 (7.7)
Enterococcus	3 (7.7)
Pseudomonas	2 (5.1)
Total	39 (100)

Table 3: Antibiotic sensitivity pattern of the isolates

		Strains sensitive to antibiotics, n (%)								
Bacterial isolates	*No*	*AMP*	*AUG*	*PNC*	*NIT*	*FOS*	*CEFX*	*CEFR*	*PMD*	*CTX*
Escherichia coli	18	5 (27.8)	14 (77.8)	0	16 (89)	17 (94.4)	11 (61)	11 (61)	6 (33.3)	13 (72.2)
Streptococcus	7	2 (28.6)	2 (28.6)	4 (57)	2 (28.6)	2 (28.6)	0	0	0	6 (85.7)
Staphylococcus	4	0	2 (50)	0	0	2 (50)	0	2 (50)	0	1 (25)
Klebsiella	3	0	3 (100)	0	0	3 (100)	0	2 (66.7)	0	2 (66.7)
Enterobacter	3	2 (66.7)	3 (100)	0	3 (100)	1 (33.3)	0	1 (33.3)	0	1 (33.3)
Pseudomonas	2	0	0	0	0	0	2 (100)	0	0	1 (50)
Citrobacter	2	0	0	0	1 (50)	2 (100)	1 (50)	2 (100)	0	2 (100)
Overall sensitivity of all isolates	39	9 (23)	24 (61)	4 (10)	22 (56)	27 (69)	14 (36)	18 (46)	6 (15)	26 (66.6)
Overall resistance to all isolates	39	30 (76)	15 (38.5)	35 (89.7)	17 (43.6)	12 (30.8)	25 (64.1)	21 (53.8)	33 (84.6)	13 (33.3)

AMP: Ampicillin, AUG: Augmentin, PNC: Penicillin, NIT: Nitrofurantoin, FOS: Fosfomycin, CEFX: Cefixime, CEFR: Cefuroxime, PMD: Pipemidic acid, CTX: Ceftriaxone

Fosfomycin with 94.4% sensitivity and nitrofurantoin with 89% sensitivity were seen as first- and second-line antibiotics for the treatment of *E. coli*. The next common isolate was *Streptococcus*, which showed low sensitivity to most antibiotics and 85.7% sensitivity to ceftriaxone. *Staphylococcus aureus* and *Pseudomonas* isolates showed multidrug resistance. *Klebsiella* and *Enterobacter* showed 100% sensitivity to augmentin (amoxil/clavulanic acid).

Overall, for all isolates, highest sensitivity was seen for fosfomycin (69.20%), ceftriaxone (66.6%), and augmentin (61%). On the contrary, the three most common antibiotics used in pregnancy show highest overall resistance for all isolates, that is, penicillin (89.6%), pipemidic acid (84.6%), and Ampicillin (76%).

DISCUSSION

The incidence of ASB was 26% in our study, which was surprisingly high. In a systemic review, Schnarr and Smaill[7] reported that prevalence remained constant at about 2 to 10%. Other literature revealed a wide range of variance in prevalence, that is, 5.2% in Brazil,[10] 10% in India,[11] 10.2 to 18.8% in Ethiopia,[12,13] 26% in Bangladesh,[14] and 45.3% in Nigeria.[15] The incidence in our study was close to that of Bangladesh and was comparatively higher than other regions, except for Nigeria where it was 45.3%. There was no association of ASB with increasing age, parity, BMI, and presence of diabetes mellitus, which are described as risk factors in certain studies.[16-20] Information on socioeconomic class and history of previous UTI could not be obtained from medical records, and hence their association with ASB was not determined.

The most common pathogen isolated was *E. coli* (46.2%), similar to what was reported in other studies.[21,22] The second most common pathogen was *Streptococcus* (17.9%) that was not commonly reported in the literature, but few older studies reported a rate of approximately 5%.[21] Other organisms in this study were *S. aureus* (10.3%), *Klebsiella* (7.7%), and *Enterococcus* (7.7%). Literature reported *Klebsiella* as the second most frequently isolated pathogen after *E. coli*. Tadesse et al[13] reported similar frequency of isolates in their study. *Pseudomonas* is considered a nosocomial pathogen and though less common (5.2%), seems difficult to treat due to multidrug resistance.

Interesting pattern was seen in antibiogram. None of the most common isolates, that is, *E. coli*, *Streptococcus*, and *S. aureus*, showed 100% sensitivity to any antibiotic, and multidrug resistance was seen against these. The highest sensitivity for all pathogens was seen in fosfomycin (69%), ceftriaxone (66.6%), and augmentin (61%). As ceftriaxone is injectable and augmentin is not a preferable drug for premature fetus, fosfomycin seems to be the drug of choice for treatment of ASB. However, it is recommended to culture urine and prescribe antibiotics according to sensitivity and not to prescribe commonly used antibiotics empirically for the treatment of ASB due to drug resistance. This drug resistance was also seen in our study as well as reported by Pereira Vasconcelos et al[10] and Hernandez et al.[23]

With increasing awareness and consistent evidence of association of ASB with adverse maternal and perinatal outcome, it is prudent to screen every pregnant woman for ASB. This is highly recommended considering high incidence in many regions, including ours. Urine culture is the gold standard diagnostic tool for screening of ASB, but detection of nitrite on dipstick or leukocyte esterase/nitrite on urinalysis can be used for screening if they are cost constraints.[24-26] The urine needs to be cultured separately to identify its sensitivity to antibiotics if the findings are positive. An antibiotic that has maternal and fetal safety, good efficacy, and low resistance in a given population should be prescribed.[7]

CONCLUSION

Incidence of ASB was significantly high. The most common bacterium isolated was *E. coli*. Due to large variance in prevalence worldwide, incidences should be studied in local population and antibiotics should be prescribed according to culture and sensitivity to address the issue of multidrug resistance.

REFERENCES

1. Cunningham FG, Lucas MJ. Urinary tract infections complicating pregnancy. Baillieres Clin Obstet Gynaecol 1994 Jun;8(2):353-373.
2. Le J, Briggs GG, Mckeown A, Bustillo G. Urinary tract infections during pregnancy. Ann Pharmacother 2004 Oct;38(10):1692-1701.
3. Mittendorf R, Williams MA, Kass EH. Prevention of preterm delivery and low birth weight associated with asymptomatic bacteriuria. Clin Infect Dis 1992 Apr;14(4):927-932.
4. National collaborating Centre for Women's and Children's Health. Clinical Guidelines 6. Antenatal care. Routine care for the healthy pregnant women. National Institute for Clinical Excellence; 2003.
5. US Preventative Services Task force. Screening for asymptomatic bacteriuria: U.S. Preventative Services Task Force reaffirmation recommendation statement. Ann Intern Med 2008 Jul;149(1): 43-47.
6. Nicolle, LE. Screening for asymptomatic bacteriuria in pregnancy. In: Canadian guide to clinical and preventative health care. Ottawa: Health Canada; 1994. p. 100-106.
7. Schnarr J, Smaill F. Asymptomatic bacteriuria and symptomatic urinary tract infections in pregnancy. Eur J Clin Invest 2008 Oct;38(S2):50-57.
8. Kass, EH. The role of asymptomatic bacteriuria in the pathogenesis of pyelonephritis. In: Quinn, EL.; Kass, EH., editors. Biology of pyelonephritis. Boston: Little Brown and Co.; 1960. p. 399-412.

9. Nicolle LE, Bradley S, Colgan R. Infectious diseases of American guidelines for the diagnosis and treatment of ASB in adults. Clin Infect Dis 2005 Mar;40:643-654.
10. Pereira Vasconcelos FE, Filho Figueiro AE, Oliveira MV, Fernandes OC, Moura SC, Coelho RL, Breda l. Urinary tract infection in high risk pregnant women. Rev Patol Trop 2013 Jan-Mar;42(1):21-29.
11. Girishbabu RJ, Srikrishna R, Ramesh ST. Asymptomatic bacteriuria in pregnancy. Int J Biol Med Res 2011;2(3):740-742.
12. Ferede G, Yismaw G, Wondimenehy Y, Sisay Z. The prevalence and antimicrobial susceptibility pattern of bacterial uropathogen isolated from pregnant women. Eur J Exp Biol 2012;2(4):1497-1502.
13. Tadesse E, Teshome M, Merid Y, Kibret B, Shimelis T. Asymptomatic urinary tract infection among pregnant women attending the antenatal clinic of Hawassa Referral Hospital, Southern Ethiopia. BMC Res Notes 2014 Mar;7:155.
14. Parveen K, Momen A, Begum AA, Begum M. Prevalence of urinary tract infections during pregnancy. J Dhaka National Med Coll Hos 2011;17(2):8-12.
15. Imade PE, Izekor PE, Eghafona NO, Enabulele OI, Ophori E. Asymptomatic bacteriuria among pregnant women. N Am J Med Sci 2010 Jun;2(6):263-266.
16. Hamdam ZH, Ziad MHA, Ali KS, Adam I. Epidemiology of urinary tract infections and antibiotics sensitivity among pregnant women at Khartoum North Hospital. Ann Clin Microbiol Antimicrob 2011 Jan;10:2. Available at: http://www.ann-clinmicrob.com/content/10/1/2.
17. Massinde A, Gumodoka B, Kilonzo A, Mshana SE. Prevalence of urinary tract infection among pregnant women at Bugando Medical centre, Mwanza, Tanzania. Tanzan J Health Res 2009 Jul;11(3):154-159.
18. Haider G, Zehra N, Munir AA, Haider A. Risk factors of urinary tract infection in pregnancy. J Pak Med Assoc 2010 Mar;60(3):213-216.
19. Dimetry SR, EL-Tokhy HM, Abdo NM, Ebrahim MA, Eissa M. Urinary tract infection and adverse outcome of pregnancy. J Egypt Public Health Assoc 2007;82(3-4):203-218.
20. Basu JK, Jeketera CM, Basu D. Obesity and its outcomes among pregnant South African women. Int J Gynaecol Obstet 2010 Aug;110(2):101-104.
21. Khattak MA, Khattak S, Khan H, Ashiq B, Mohammad D, Rafiq M. Prevalence of asymptomatic bacteriuria in pregnant women. Pak J Med Sci 2006 Apr-Jun;22(2):162-166.
22. Khattak MA, Khan H, Mashud UI, Ashiq B, Shah HS. Antimicrobial sensitivity pattern of urine isolates from asymptomatic bacteriuria in pregnancy. Biomedica 2006;Bio-9:22.
23. Hernandez BF, Lopez Carmones JM, Rodriguez M, Peralta Pedrero ML, Rodriguez Gutiererrez RS, Ortiz Aguirre AR. Asymptomatic bacteriuria frequency in pregnant women and uropathogen *in vitro* antimicrobial sensitivity. Ginecol Obstet Mex 2007 Jun;75(6):325-331.
24. Tincello DG, Richmond DH. Evaluation of reagent strips in detecting asymptomatic bacteriuria in early pregnancy: Prospective case series. BMJ 1998 Feb;316(7129):435-437.
25. Garingalo-Molina FD. Asymptomatic bacteriuria among pregnant women; Overview of diagnostic approaches. Phil J Microbiol Infect Dis 2000;29(4):177-186.
26. Deville WL, Yzermans JC, Van Duijn NP, Bezemer PD, Vander Windt DA, Bouter LM. The urine dipstick test useful to rule out infections. A meta-analysis of accuracy. BMC Urol 2004 Jun;4:4.