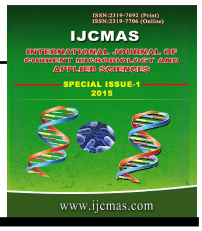
Int.J.Curr.Microbiol.App.Sci (2015) Special Issue-1: 110-117

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Special Issue-1 (2015) pp. 110-117**
http://www.ijcmas.com



Original Research Article

Prevalence of Asymptomatic Urinary Tract Infections in the Three Trimesters of Pregnancy

Goyal Ankur[1]*, Srivastava Namita[1], Goyal Sapna[1], Pathak Anu[2], Mani Neha K[1], Shams Daniya[1], Agrawal Khushi[1] and Singh Saroj[2]

[1]Department of Microbiology, SN Medical College, Agra, India
[2]Department of Obstetrics and gynaecology, SN Medical College, Agra, India
**Corresponding author*

Keywords

Pregnant women, Trimester, UTI, Asymptomatic Bacteriuria, Urine culture

A B S T R A C T

Asymptomatic bacteriuria is now an established entity in the spectrum of urinary tract infections (UTIs) especially in pregnant females, which may result in increased risk of prematurity, low birth weight babies and prenatal death if untreated. Therefore this study was conducted to determine the prevalence and antimicrobial susceptibility in pregnant females in each trimester. A total of 431 asymptomatic pregnant women attending the antenatal clinic, were consecutively selected. For each sample routine microscopy, culture on CLED, identification of organisms and AST was performed as per standard protocol. Out of 431 pregnant females, 38 women (8.8%) were positive for culture. Amongst the 431, 90 were within the first trimester of pregnancy with significant bacteriuria in 15 (16.66%); 161 were in their second trimester with significant bacteriuria in 11 (6.83%) and 180 in third trimester with significant bacteriuria in 12 (6.66%). 52.63% of positive cases were multiparous females while 42.3% were primigravida. On routine microscopy, significant pyuria was found in 44.73% of positive cases. The most common organism isolated was *Escherichia coli* (39.47%) followed by *Staphylococcus aureus* (23.68%), *Staphylococcus saprophyticus* (10.52%), *Enterococcus spp* (7.89%), *Klebsiella spp* (5.26%), *Proteus spp* (5.26%), *Candida* (5.26%) and *Pseudomonas aeruginosa* (2.63%). 27% of the gram negative organisms isolated were ESBL producers. The association of asymptomatic bacteriuria in pregnant females in the present study necessities the role of urine culture in all trimesters of pregnancy with treatment by appropriate antibiotic therapy based on sensitivity test so as to avoid maternal-fetal complications.

Introduction

Asymptomatic bacteriuria (ASB) is now an established entity in the spectrum of urinary tract infections (UTIs). Asymptomatic bacteriuria is defined as a significant bacterial count (> 10^5 organisms or colony forming units present per milliter) in the urine of a person without symptoms (Kass,1960). Asymptomatic bacteriuria may

precede symptomatic urinary tract infection in individuals with predisposing factors, such as the elderly, pregnancy, children with subtle anatomical defects of the urinary tract, patients with chronic diseases like diabetes mellitus, those who have urinary catheters, and patients who are admitted to hospital for lengthy periods.

2 to 10% of pregnant women are found to suffer from asymptomatic bacteriuria. Various anatomic and physiological changes which include dilatation of the renal pelvis and ureters in as early as the eighth week of pregnancy (Fried, 1979) and displacement of the bladder itself superiorly and anteriorly are responsible for ASB. Also, smooth muscle relaxation induced by progesterone may also play a role. As a consequence of smooth muscle relaxation, peristalsis of the ureters are decreased, bladder capacity is increased which in turn lead to urinary stasis. Other factors facilitating bacterial growth include differences in urine pH and osmolality and pregnancy-induced glycosuria and aminoaciduria (Jeyabalan and Lain, 2007).

Asymptomatic bacteriuria in pregnant females may result in increased risk of developing acute pyelonephritis, postpartum UTI, hypertensive disease, anaemia, prematurity, low birth weight babies and prenatal death if untreated (Jayalakshmi and Jayaram, 2008; Kacmaz *et al.,* 2006). Asymptomatic bacteriuria, as a cause of preterm delivery and low birth weight has been well documented (Conolly and Thorp, 1999; Delzell and Lefevre, 2000). Up to 27% of preterm births have been associated with clinical forms of UTI (Kaul *et al.,* 1999).

However, variations have been noted to exist in the incidence of bacteriuria and subsequent UTI in pregnant females in different countries and this has been attributed to differences in definition, methods of screening and associated risk factors such as age, parity and pregnancy. Therefore, screening for and treatment of asymptomatic bacteriuria in pregnancy should become a standard protocol and most antenatal guidelines have included routine screening for asymptomatic bacteriuria (National Collaborating Centre for Women's and Children's Health, 2003;US Preventative Services Task Force, 2008; Nicolle, 1998; Nicolle *et al.,* 2005; Naber *et al.,* 2001; Scottish Intercollegiate Guidelines Network, 2006).

In spite of universal recommendation for screening of asymptomatic bacteriuria, these guidelines have been largely ignored. Therefore the present study aims to determine the prevalence and identify the etiological agents associated with asymptomatic bacteriuria in various trimesters simultaneously and its sensitivity test to various antibiotics in antenatal mothers.

Materials and Methods

This prospective study on asymptomatic bacteriuria was carried out in a tertiary care hospital from March 2014 to September 2014. A total of 431 asymptomatic pregnant women attending the antenatal clinic, were consecutively selected. The study and data collection were carried out with approval from the Institutional Ethical Committee. Informed consent was taken from all the patients. Pregnant women with h/o UTI symptoms (dysuria, frequency and urgency, etc.), pregnancy induced diabetes, hypertension, h/o antibiotic intake in previous two weeks and pyrexia were excluded from the study. Standard questionnaires were filled in order to obtain socio-demographic data such as age, parity and duration of gestation.

All the pregnant ladies were then explained to collect clean catch midstream urine samples into wide-mouthed sterile capped containers after proper cleansing of the external genitalia. Microscopic examination was done to detect the presence of pus cells, epithelial cells, crystals and yeast like cells, as per standard protocol.

From each specimen, urine was cultured on cystein lactose electrolytic deficient (CLED) as per standard protocol. The growth was interpreted as significant if the number of colonies corresponded to 10^5 colony forming units (CFU) per ml. Antimicrobial susceptibility test were performed using Kirby-Bauer Disc Diffusion test using standard CLSI guideline. All the data was analyzed using SPSS 14.0 software.

Result and Discussion

Out of 431 pregnant females, 38 women (8.8%) were positive in culture, while 373 women were sterile. Twenty samples were reported as contaminants. The study showed highest number of culture positive cases among pregnant women in the age group 26–35 years (73.68%). This was closely followed by 18–25 (26.31%)

Out of the 431 asymptomatic pregnant women, 90 were within the first trimester of pregnancy with 15 (16.66%) testing positive for significant bacteriuria;161 were in their second trimester of pregnancy with 11 (6.83%) tested positive for significant bacteriuria and 180 in their third trimester of pregnancy with 12 (6.66%) testing positive for significant bacteriuria (Table 1). On direct microscopy, significant pyuria was found in 44.73% of our positive cases.

According to parity 42% of total positive cases were nulliparous females while 58% were multiparous females. Nulliparous showed significantly higher prevalence of ASB in second trimester, while in multiparous, ASB was significantly more in third trimester, however the difference was not statistically significant.

The most common organism isolated in this study is Escherichia coli (39.47%) followed by *Staphylococcus aureus* (23.68%), *Staphylococcus saprophyticus* (10.52%), *Enterococcus spp* (7.89%), *Klebsiella spp* (5.26%), *Proteus spp* (5.26%), *Candida* (5.26%) and *Pseudomonas aeruginosa* (2.63%). Gram negative ASB showed a high variability in terms of period of pregnancy. Overall 53% of positive cases in first trimester, 82% in second and 25% in third trimester were due to gram negative organisms. Difference in second and third trimester was statistically significant.

Overall the antibiotic susceptibility patterns of the gram positive and gram negative organisms are shown in tables 2 and 3.

In this study the prevalence of asymptomatic bacteriuria among pregnant females is 8.8%. The prevalence in various Indian studies was found to be between 5 & 12%, however, in Western studies, the incidence ranges from 2–7% (Ginecol Obstet Mex, 2007; Tadesse *et al.,* 2007; Turpin *et al.,* 2007; Kerure *et al.,* 2013; Yashodhara *et al.,* 1987; Obirikorang *et al.,* 2012).

According to our study, 8.8% of pregnant females enrolled in the study are at risk of developing acute episodes and complications of UTI during pregnancy if they are not properly treated. Stasis of urine by gravid uterus, poor genital hygiene by pregnant women, pregnancy-induced glycosuria and aminoaciduria are among the leading reasons for high prevalence of asymptomatic bacteriuria in pregnancy (Imade *et al.,* 2010).

In this study highest percentage of asymptomatic bacteriuria was detected in the age group 26-35 followed by 18-25.Similar age patterns were also observed in studies by Imade *et al.* (2010) and Turpin *et al.* (2007). Advanced maternal age is found to be associated with increased risk of asymptomatic bacteriuria in pregnancy, as women of this age group are likely to be multiparous which is a risk factor for acquiring asymptomatic bacteriuria in pregnancy (Akinloye *et al.,* 2006; Fatima and Ishrat, 2006).

In this study significant pyuria with bacteriuria was found in 44.73% of our positive cases. So, significant pyuria alone should not be considered as screening test for asymptomatic bacteriuria, as this would result in large number of false negative cases. In our study, 55.26% cases would have been reported as false negative, if urine routine microscopy alone is used. Therefore, culture should be recommended for all pregnant females to rule out asymptomatic bacteriuria. Other studies also reported that routine microscopy alone cannot detect all cases of asymptomatic bacteriuria. Study by Macejko and Schaeffer (2007) and Bachman *et al.* (1993) reported 50% pyuria in positive cases.

In nulliparous prevalence of ASB was significantly higher in second trimester while in multiparous ASB was significantly more in third trimester, however overall we found asymptomatic bacteriuria to be more common in multiparous women than primigravida. 52.63% of positive cases were multiparous females while 42.3% were primigravida. This is in consistency with other studies. Obirikorang *et al.* (2012) also reported higher prevalence of asymptomatic bacteriuria in multigravida than primigravida.

In the present study, most cases were in first trimester followed by third which is followed by second trimester. Reason could be that women in first trimester can be more sexually active than female in second and third trimester. However this is contrary to other studies. Durowaiye *et al.* (2003) found highest prevalence in third trimester.

The present work, like other studies showed *Escherichia coli* (39.47) to be the most common organism isolated. Other organisms isolated include *Staphylococcus aureus* (23.68%). *Staphylococcus saprophyticus* (10.52%), *Enterococcus spp* (7.89%), *Klebsiella spp* (5.26%), *Proteus spp* (5.26%), *Candida* (5.26%) and *Pseudomonas aeruginosa* (2.63%). These results are in correlation with other studies. Alex Boye *et al.* (2012) also found *E. coli* to be the most common organism. In this study, gram negative bacteria dominated over gram positive bacteria as the etiological agent for UTI.

This could be attributed to the reason that gram negative bacteria are normal flora of the intestinal tract especially the rectum which is in close proximity to the urethral orifice (Anyamene *et al.,* 2002; Obiogbolu *et al.,* 2009). During pregnancy there is increase in levels of amino acids and lactose which particularly encourages *E. coli* growth. It could also be due to infection by fecal contamination due to poor hygiene during pregnancy (Obiogbolu *et al.,* 2009). However, interestingly in the present study, in third trimester, gram positive bacteria dominated over gram negative bacteria as cause of urinary tract infection. The reason is unknown.

This study revealed that all the urinary isolates were sensitive to imipenem and nitrofurantoin. Tamalli (2013) in his study found most of the urinary isolates to be sensitive to nitrofurantoin. Most of the

urinary isolates were sensitive to meropenem and amikacin. Urinary isolates exhibited high resistance pattern to fluroquinolones. 27% of the gram negative organisms isolated were ESBL producers. Most of the gram positive organisms were sensitive to teicoplanin, linozolid and chloramphenicol, however only 15.38% of gram positive organisms were sensitive to cotrimoxazole and ciprofloxacin. The high antibiotic resistant pattern in present study of asymptomatic bacteriuria cases could be attributed to antibiotic abuse due to self medication and inappropriate usage.

Table.1 Prevalence of asymptomatic bacteriuria according to parity and trimester

	Nulliparous (16)	**Multiparous (22)**	**Total (38)**
1st trimester (n=90)	7 (43.75%)	8 (36.36%)	15 (39.47%)
2 trimester (n=161)	7 (43.75%)	4 (18.18%)	11 (28.94%)
3 trimester (n=180)	2 (12.5%)	10 (45.45%)	12 (31.57%)

Table.2 Antibiotic susceptibility pattern of gram negative organisms isolated

S.No	Antibiotic Disc	Sensitive	Percentage	Resistant	Percentage
1	Ampcillin	13	68.4%	6	31.6%
2	Amoxicillin/clabulanic acid	14	73.68%	5	26.32%
3	Piperacillin	13	68.4%	6	31.6%
4	Ampcillinsulvactum	14	73.68%	5	26.32%
5	Cephalothin	12	63.15%	7	36.85%
7	Ceftriaxone	12	63.15%	7	36.85%
8	Ceftazidime	12	63.15%	7	36.85%
9	Tetracyclin	9	47.36%	10	52.64%
10	Nitrofurantoin	19	100%	0	0.00%
11	Ciprofloxacin	5	26.31%	14	73.69%
12	Moxifloxacin	9	47.36%	10	52.64%
13	Chloramphenicol	14	73.68%	5	26.32%
14	Gentamicin	16	84.21%	3	15.79%
15	Amikacin	18	94.73%	1	5.27%
16	Levofloxacin	9	47.36%	10	52.64%
17	Cotrimoxazole	14	73.36%	5	26.32%
18	Meropenem	18	94.73%	1	5.27%
19	Imipenem	19	100%	0	0.00%

Table.3 Antibiotic susceptibility pattern of gram positive organisms isolated

S.No.	Antibiotic Disc	Sensitive	Percentage	Resistant	Percentage
1	Penicillin –G	6	46.15%	7	53.85%
2	Amoxicillin	7	53.84%	6	46.16%
3	Ampcillinsulbactum	11	84.61%	2	15.39%
4	Cotrimoxazole	2	15.38%	11	84.62%
5	Ofloxacin	4	30.76%	9	69.24%
6	Clindamycin	11	84.61%	2	15.39%
7	Teicoplanin	12	92.30%	1	7.70%
8	Linozolid	12	92.30%	1	7.70%
9	Vancomycin	11	84.61%	2	15.39%
10	Ampicillin	6	46.15%	7	53.85%
11	Tetracyclin	7	53.84%	6	46.16%
12	Levofloxacin	4	30.76%	9	69.24%
13	Chloramphenicol	12	92.30%	1	7.70%
14	Ciprofloxacin	2	15.38%	11	84.62%

In conclusion, the association of asymptomatic bacteriuria in pregnant females in the present study necessities the role of urine culture in all trimesters of pregnancy with treatment by appropriate antibiotic therapy based on sensitivity test so as to avoid maternal-foetal complications.

References

Akinloye, O., Ogbolu, D.O., Akinloye, O.M., Terryalli, O.A. 2006. Asymptomatic bacteriuria in pregnancy in Ibadan, Nigeria: a re-assessment. *Br. J. Biomed. Sci.,* 63(3): 109–112.

Alex Boye, Peter Mate Siakwa, Johnson Nyarko Boampong, *et al.* 2012. Asymptomatic urinary tract infections in pregnant women attending antenatal clinic in Cape Coast, Ghana. *E3 J. Med. Res.,* Vol. 1(6): 074–083.

Anyamene, C.O., Stellamaris, N., Muoneke Umerie, G.N.C. 2002. Bacterial isolates associated with urinary tract infections in Akwa and environs. *J. Appl. Sci.,* 5(4): 3092–3098.

Bachman, J.W., Heise, R.H., Naessens, J.M., *et al.* 1993. A study of various tests to detect asymptomatic urinary tract infections in an obstetric population. *JAMA,* 270: 1971–1974.

Conolly, A., Thorp, J.M. 1999. Urinary tract infections in pregnancy. *Urol. Clin. North Am.,* 26: 779–787.

Delzell, J.E., Lefevre, M.L. 2000. Urinary tract infections during pregnancy. *Am. Fam. Phys.,* 61: 713–721.

Durowaiye, M.T., Onaolapo, J.A., Oyi, A.R. Lindsay, E.N. 2003. Screening for asymptomatic bacteriuria in pregnancy. Canadian guide to clinical preventive health care. 1: 100–106.

Fatima, N., Ishrat, S. 2006. Frequency and risk factors of asymptomatic bacteriuria during pregnancy. *J. Coll. Phys. Surg. Pak.,* 16(4): 273–275.

Fried, A.M. 1979. Hydronephrosis of pregnancy: ultrasonographic study

and classification of asymptomatic women. *Am. J. ObstetGynecol.,* 135: 1066–70.

Ginecol Obstet Mex, 2007. 75: 325–331.

Imade, P.E., Izekor, P.E., Eghafona, N.O., Enabuele, 0.I., Ophori, E. 2010. Asymptomatic bacteriuria among pregnant women. *North Am. J. Med. Sci.,* 2(6): 263–266.

Jayalakshmi, J., Jayaram, V.S. 2008. Evaluation of various screening tests to detect asymptomatic bacteriuria in pregnant women. *Indian J. Pathol. Microbiol.,*51(3): 379–381.

Jeyabalan, A., Lain, K.Y. 2007. Anatomic and functional changes of the upper urinary tract during pregnancy.UrolClin North Am 2007;34:1–6.

Kacmaz, B., Cakir, O., Aksoy, A., Biri, A. 2006. Evaluation of rapid urine screening tests to detect asymptomatic bacteriuria in pregnancy. *Jpn. J. Infect. Dis.,* 59(4): 261–263.

Kass, E.H. 1960. Bacteriuria and pyelonephritis of pregnancy. *Arch. Intern. Med.,* 105: 194–198.

Kaul, A.K., Khan, S., Martens, M.G., etal. 1999. Experimental gestational pyelonephritis induces preterm births and low birth weights in C3H/HeJ mice. *Infect. lmmun.,* 67: 5958–5966.

Kerure, S.B., Surpur, R., Sagarad, S.S., Hegadi, S. 2013. Asymptomatic bacteriuria among pregnant women. *Int. J. Reprod. Contracept. Obstet. Gynecol.,* 2: 213–216.

Macejko, A.M., Chaeffer, A.J. 2007. Asymptomatic bacteriuria and symptomatic urinary tract infections during pregnancy. *Urol. Clin. North Am.,* 34: 35–42.

Naber, K.G., Bergman, B., Bishop, M.C., Bjerklund-Johansen, T.E., Botto, H., Lobel, B., *et al.* 2001. EAU guidelines for the management of urinary and male genital tract infections. Urinary Tract Infection (UTI) Working Group of the Health Care Office (HCO) of the European Association of Urology (EAU). *Eur. Urol.,* 40: 576–88.

National Collaborating Centre for Women's and Children's Health. 2003. Clinical Guidelines Antenatal Care. Routine care for the healthy pregnant woman. London: National Institute for Clinical Excellence.

Nicolle, L.E. 1994. Screening for asymptomatic bacteriuria in pregnancy. In: Canadian Guide to Clinical and Preventative Health Care. Ottawa: Health Canada. Pp. 100–6.

Nicolle, L.E., Bradley, S., Colgan, R., Rice, J.C., Schaeffer, A., Hooton, T.M. 2005. Infectious diseases society of America guidelines for the diagnosis and treatment of asymptomatic bacteriuria in adults. *Clin. Infect. Dis.,*40: 643–54.

Obiogbolu, C.H., Okonko, I.O., Anyamere, C.O., *et al.* 2009. Incidence of urinary tract infections (UTIs) among pregnant women in Akwametropolis, Southeastern Nigeria. *Sci. Res. Essay,* 4: 820–824.

Obirikorang, C., Quaye, L., Bio, F.Y., Amidu, N., Acheampongand, I., Addo, K. 2012. Asymptomatic bacteriuria among pregnant women attending antenatal clinic at the university hospital, Kumasi, Ghana. *J. Med. Biomed. Sci.,* 1(1): 38–44.

Scottish Intercollegiate Guidelines Network. 2006. Management of suspected bacterial urinary tract infection in adults. A national clinical guideline. Scottish Intercollegiate Guidelines Network, Edinburgh.

Tadesse, A., Negash, M., Ketema, L.S. 2007. Asymtomatic bacteriuria in

pregnancy: assessment of prevalence, microbial agents and their antimicrobial sensitivity pattern in Gondar Teaching Hospital, north west Ethiopia. *Ethiop. Med. J.,* 45: 143–149.

Tamalli, M., Bioprabhu Sangar, Alghazal, M.A. 2013. Urinary tract infection during pregnancy at Al-khoms, Libya. *Int. J. Med. Med. Sci.,* 3(5): 455–459.

Turpin, C., Minkah, B., Danso, K., Frimpong, E. 2007. Asymptomatic bacteriuria in pregnant women attending antenatal clinic at komfoanokye teaching hospital, kumasi, ghana. *Ghana Med. J.,* 41: 26–29.

US Preventative Services Task Force. Screening for asymptomatic bacteriuria: U.S. Preventative Services Task Force reaffirmation recommendation statement. *Ann. Intern. Med.,* 149: 43–43.

Yashodhara, P., Mathur, R., Raman, I. 1987. Urinary tract infection in pregnancy. *Indian J. Med. Res.,* 86: 309–14.