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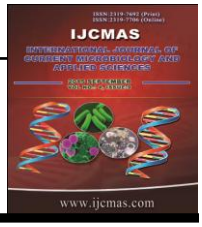

Original Research Article

Incidence, Microbiological Profile and Antibiotic Susceptibility Pattern of Symptomatic and Asymptomatic Bacteriuria in Antenatal Women

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Keywords

Symptomatic and asymptomatic bacteriuria, Antenatal women, Microbiological profile

A B S T R A C T

Urinary tract infection (UTI) during pregnancy is the most common health problem, especially in developing countries and requires medical treatment as soon as it is detected. Each pregnant woman was instructed how to collect a 'clean-catch' mid-stream urine specimen. After doing wet mount of the urine samples, these specimens were directly inoculated onto Blood agar, MacConkey agar, Cystine lactose electrolyte deficient agar and UTI ChromAgar using a standard calibrated 4mm wire loop (0.01ml). Streaked culture plates were incubated at 37^0C overnight. On the next day, the bacterial growth on the respective media was observed, with UTI ChromAgar displaying different colored colonies for different isolates. Colony count was done to check for significant bacteriuria by semi quantitative method where 100 colonies and more were considered significant. All the significant isolates were identified by standard bacteriological procedures like study of colony characters then subjecting them to battery of biochemical tests. Antimicrobial susceptibility testing was performed individually for bacterial isolates using Kirby Bauer's agar disc diffusion method as described by the CLSI guidelines. A total of 300 urine samples were collected from pregnant women attending obstetric OPD at our hospital. Two hundred samples were from asymptomatic women and hundred samples were from symptomatic women. Out of the 200 asymptomatic women sampled, 21 (10.5%) were positive for significant bacteriuria. Out of 100 symptomatic women sampled, 24 showed growth more than 10^5colonies/ml. The most common isolates in asymptomatic bacteruria were *E. coli* (42.8%) followed by *Enterococci* (33.3%), *Klebsiella* (14.2%) and *Pseudomonas* (4.76%) and Coagulase negative *Staphylococcus* (CONS) (4.76%). The prevalent isolates in symptomatic women were *Escherichia coli* (45.8%), *Klebsiella* (25%), Coagulase negative *Staphylococcus* (12.5%) *Enterococci* (8.33%) and *Proteus* (8.33%). All the isolates of asymptomatic bacteriuria were sensitive to Gentamicin and 62.5% isolates were sensitive to Nitrofurantoin. Ninety six percent isolates of symptomatic bacteriuria were sensitive to Nitrofurantoin and Gentamicin. This study shows an incidence of 10.5% of asymptomatic bacteriuria and 24% of symptomatic bacteriuria. It is hence vital that pregnant women are screened for bacteriuria from time to time in every trimester of the gestation. Follow up cultures after treatment is also essential to confirm clearance of infection.

Introduction

Urinary tract infection (UTI) during pregnancy is the most common health problem, especially in developing countries and requires medical treatment as soon as it is detected. In pregnancy, UTI is caused mainly by the colonization of micro-organisms in urinary tract, involving lower urinary tract. The urinary tract undergoes several physiological and anatomical changes during pregnancy which causes urinary stasis that can be attributed for the increased incidence of UTI. Factors like hygiene and socio-economic conditions also contribute to both asymptomatic and symptomatic bacteriuria during pregnancy (Tille, 2013).

Untreated UTI in pregnancy will lead to complications like pyelonephritis, premature rupture of membranes, anemia, septic shock, preterm birth, IUGR, still birth and perinatal death (Jain *et al.,* 2013). *Escherichia coli* is the most common bacterial pathogen causing UTI in pregnancy. Other studies have shown *Klebsiella, Staphylococcus*, *Enterococcus* and *Pseudomonas* species as the commonest isolates (Saraswathi and Aljabri, 2013; Alemu *et al.,* 2012).

The successful management of patients suffering from UTI in pregnancy depends upon proper screening for bacteriuria regardless of its symptoms. Symptomatic bacteriuria can easily be diagnosed and treated because of its overt symptoms, but asymptomatic bacteriuria can be easily missed. As it is very common in pregnant women, early detection and identification of the organisms and the selection of an effective antibiotic against the organism keeping in mind the stage of pregnancy; will decrease the risk of complications in pregnancy.

Therefore, this prospective study was done to know the incidence and bacteriological profile of symptomatic and asymptomatic bacteriuria among pregnant women attending obstetrics outpatient department at a tertiary care hospital in north Karnataka and to determine their antimicrobial sensitivity patterns to aid the better management of urinary tract infections during pregnancy.

Materials and Methods

This prospective study was conducted at microbiology laboratory of a tertiary care hospital during the period of September 2011 to December 2012 by taking urine samples from consented pregnant women with or without symptoms of UTI. All pregnant women on antibiotics for past two weeks were excluded from the study.

Each pregnant woman was instructed how to collect a 'clean-catch' mid-stream urine specimen. Accordingly, about 10 to 20 ml urine specimen was collected in a sterile screw-capped, wide-mouthed container from each woman. The bottle was labeled with unique sample number, date and time of collection; then processed within 1 hour of collection. After doing wet mount of the urine samples, these specimens were directly inoculated onto Blood agar, MacConkey agar, Cystiene lactose electrolyte deficient agar and UTI ChromAgar using a standard calibrated 4mm wire loop (0.01ml). Streaked culture plates were incubated at 37^0C overnight. On the next day, the bacterial growth on the respective media was observed, with UTI ChromAgar displaying different colored colonies for different isolates. Colony count was done to check for significant bacteriuria by semi quantitative method where 100 colonies and more were considered significant (Collee and Marr, 1996).

All the significant isolates were identified by

standard bacteriological procedures like study of colony characters then subjecting them to battery of biochemical tests. The specific biochemical tests used for identification of lactose fermenting bacteria were indole, methyl red, Voges-Proskeur and citrate tests. Catalase and coagulase tests were used to differentiate the Gram positive cocci. Bile esculin test was done to confirm isolation of *Enterococci*. Antimicrobial susceptibility testing was performed individually for bacterial isolates using Kirby Bauer's agar disc diffusion method as described by the CLSI guidelines. The isolates from this study were tested against penicillin (10 µg), amoxyclav (30µg), ampicillin (10 µg), ampicillin/sulbactam (10/10 µg), ceftriaxone (30 µg), cotrimoxazole (25/1.25 µg), gentamicin (10 µg), nitrofurantoin (300 µg) and tetracycline (30 µg). Every batch of Mueller-Hilton agar and antibiotic discs was tested by using following control strains; *E. coli* ATCC 25922; *Pseudomonas aeruginosa* ATCC 27853; *Enterococcus faecalis* ATCC 29212 and *Staphylococcus aureus* ATCC 25923 (Collee and Marr, 1996).

Result and Discussion

A total of 300 urine samples were collected from pregnant women attending obstetric OPD at our hospital. Two hundred samples were from asymptomatic women and hundred samples were from symptomatic women. Out of the 200 asymptomatic women sampled, 21 (10.5%) were positive for significant bacteriuria with the highest incidence of bacteriuria being observed in pregnant women within the age group of 23-27 years (52.38%). This was followed by women within the age group of 18-22 years (42.85%) and then 28-32 years age (4.76%). Women aged 33 and above did not show significant bacteruria in this study. Out of 100 symptomatic women sampled, 24 showed growth more than 10^5colonies/ml with highest incidence of bacteriuria in women aged 28–32 years (50.0%), followed by 18–22 years (20.83%) age group, 23–27 years (16.6%) age group, 33–38 years (8.33%) age group and lastly 39–43 years (4.16%) age group.

Of the 200 asymptomatic women tested for bacteriuria, 190 were in their first trimester and 10 were in their early second trimester where as out of the 100 symptomatic women tested, majority (58%) were in their second trimester followed by 34% in their first and 8% in their third trimester of pregnancy. Highest number of positives for symptomatic bacteriuria was found to be in the second trimester (54.1%), followed by third trimester (29.16%) and first trimester (16.66%). The comparison of incidence of bacteriuria based on gestational age in asymptomatic and symptomatic bacteriuria in the study population is displayed in Table 1.

Out of positive bacteriuria cases in asymptomatic women, 16 (76.1%) were primigravida where as in symptomatic women who showed significant bacteriuria, 21 (87.5%) were multiparous with atleast one existing child. Significant history of past urinary tract infection was given by 15 (62.5%) of the symptomatic women tested positive and 4 (19.04%) of the asymptomatic women tested positive for significant bacteriuria. Comparison of asymptomatic and symptomatic bacteriuria based on parity is demonstrated in Table 2.

The most common isolates in asymptomatic bacteruria were *E. coli* (42.8%) followed by *Enterococci* (33.3%), *Klebsiella* (14.2%) and *Pseudomonas* (4.76%) and Coagulase negative *Staphylococcus* (CONS) (4.76%). The prevalent isolates in symptomatic women were *Escherichia coli* (45.8%), *Klebsiella* (25%), Coagulase negative *Staphylococcus* (12.5%) *Enterococci*

(8.33%) and *Proteus* (8.33%). All the isolates of asymptomatic bacteriuria were sensitive to Gentamicin and 62.5% isolates were sensitive to Nitrofurantoin. Ninety six percent isolates of symptomatic bacteriuria were sensitive to Nitrofurantoin and Gentamicin. The antibiotic sensitivity pattern of different isolates in asymptomatic and symptomatic bacteriuria is compared in Table 3 and Table 4.

The incidence of asymptomatic bacteriuria is 10.5% and symptomatic bacteriuria is 24% among pregnant women in our study. Varying incidence rates have been reported in various studies made on asymptomatic bacteriuria in India with a range of 5–20%. (Saraswathi and Aljabri, 2013; Ansari and Rajkumari, 2011; Dash *et al.*, 2013). The results of this study compares well with that done by Ansari HQ (Ansari and Rajkumari, 2011). The variations in incidence based on age, parity, socioeconomic status, sexual activity during pregnancy, significant past history of UTI and healthcare during pregnancy are also comparable with various studies (Saraswathi and Aljabri, 2013; Ansari and Rajkumari, 2011; Dash *et al.*, 2013; Ahmad *et al.*, 2011).

The most common isolates in asymptomatic bacteruria were *Escherichia coli* (42.8%) followed by *Enterococci* (33.3%) and *Klebsiella* (14.2%). Similar findings have been demonstrated by study done by Dash *et al.* (2013) Rising trends in isolation of *Enterococci* in urine samples suggest the increasing virulence of these cocci in the recent years probably due to the use of broad spectrum antibiotics. The prevalent isolates in symptomatic women were *Escherichia coli* (45.8%), *Klebsiella* (25%) and Coagulase negative *Staphylococcus* (12.5%). *Escherichia coli* is the most common isolate in UTI in pregnancy as suggested by several studies (Saraswathi and Aljabri, 2013; Ansari and Rajkumari, 2011; Dash *et al.*, 2013; Ahmad *et al.*, 2011). Similar studies done on bacteriuria in pregnancy propose that high risk of acquiring *E. coli* UTI is due to the anatomical and physiological changes that occur during pregnancy and *E. coli* being the most common micro-organism in the vaginal and rectal area (Obirikorang *et al.*, 2012; Harris and Gilstrap, 1981). This significant finding could be due to urinary stasis occurring commonly in pregnancy allowing *E. coli* to thrive and cause UTI. The anatomical proximity of the anal and urogenital opening in females predisposes for faecal contamination of the urinary tract from commensals of the bowel of which *E. coli* is a typical example (Obirikorang *et al.*, 2012). All these factors establish the importance of maintenance of personal hygiene in pregnancy.

All the isolates of asymptomatic bacteriuria were sensitive to Gentamicin and 62.5% isolates were sensitive to Nitrofurantoin. Ninety six percent isolates of symptomatic bacteriuria were sensitive to Nitrofurantoin and Gentamicin. Several studies have observed similar antibiotic sensitivity patterns (Saraswathi and Aljabri, 2013; Ansari and Rajkumari, 2011; Dash *et al.*, 2013; Ahmad *et al.*, 2011). The choice of antibiotic is based on urine culture, stage of gestation, clinical data and the characteristics of the antibiotic (Obirikorang *et al.*, 2012). Specific guidelines are suggested for management and treatment of UTI and pyelonephritis in pregnancy, but ultimately, choice should be based on sensitivities. Even though aggressive antibiotic treatment may be required to lessen the risk of pyelonephritis and other complications of bacteriuria in pregnancy, indiscriminate use of antibiotics is to be avoided as it is known that urinary pathogens are becoming resistant to commonly used antibiotics.

Several studies also suggest follow up

cultures after treatment for confirmation of clearing of infection to prevent complications (Harris and Gilstrap, 1981; Schnarr and Smaill, 2008). Optimal length of therapy is controversial, but most recommend 3–7 days. Suppressive therapy is indicated if the pregnant woman fails to respond to both initial therapy of 3–7 days and repeat therapy with another antibiotic for 7–10 days. Patients with recurrent bacteriuria, with two episodes of symptomatic UTIs and pyelonephritis are also indicated for suppressive therapy.

Table.1 Comparison of incidence of bacteriuria based on gestational age in asymptomatic and symptomatic bacteriuria in the study population

Gestational age	Symptomatic bacteriuria		Asymptomatic bacteriuria	
	Number tested	Positive	Number tested	Positive
1st trimester	34	4	190	18
2nd trimester	58	13	10	3
3rd trimester	8	7	0	0
Total	100	24	200	21

Table.2 Comparison of asymptomatic and symptomatic bacteriuria based on parity

Parity and Past history of UTI	Symptomatic bacteriuria	Asymptomatic bacteriuria
	Positive	Positive
Nulliparous	3	16
Multiparous	21	5

Table.3 Antibiotic sensitivity pattern of different isolates in asymptomatic bacteriuria

Antibiotic	Sensitivity (Number of isolates)				
	E.coli (n=9)	Enterococcus (n=7)	*Klebsiella* (n=3)	Coagulase negative *Staphylococcus* (n=1)	*Pseudomonas* (n=1)
Amoxyclav	14.2%	44.4%	R	S	R
Ampicillin	-	-	-	S	-
Ampicillin-sulbactum	-	44.4%	-	S	R
Ceftriaxone	57.1%	R	100%	S	R
Cotrimoxazole	57.1%	R	66.6%	S	R
Gentamicin	100%	100%	100%	S	S
Nitrofurantoin	57.1%	88.8%	66.6%	S	R
Oxacillin	-	33.33%	-	S	-
Penicillin	-	33.33%	-	S	-
Tetracycline	14.2%	33.33%	-	S	-

Table.4 Antibiotic sensitivity pattern of different isolates in symptomatic bacteriuria

Antibiotic	Sensitivity (Number of isolates)				
	E.coli **(n=11)**	***Klebsiella*** **(n=6)**	**CONS (n=3)**	***Proteus*** **(n=2)**	**Enterococcus (n=2)**
Amoxyclav	81.8%	100%	100%	100%	100%
Ampicillin	-	-	100%	-	100%
Ampicillin-sulbactum	81.8%	83.3%	100%	100%	100%
Ceftriaxone	100%	83.3%	100%	100%	100%
Cotrimoxazole	63.6%	16.6%	100%	50%	100%
Gentamicin	81.8%	100%	100%	100%	100%
Nitrofurantoin	100%	83.3%	100%	100%	100%
Oxacillin	-	-	100%	-	100%
Penicillin	-	-	R	-	R
Tetracycline	-	100%	100%	-	100%

This study shows an incidence of 10.5% of asymptomatic bacteriuria and 24% of symptomatic bacteriuria. It is hence vital that pregnant women are screened for bacteriuria from time to time in every trimester of the gestation. Follow up cultures after treatment is also essential to confirm clearance of infection. Health education on personal hygiene around the urogenital and anal area to prevent fecal contamination of the urinary tract should be stressed during antenatal visits.

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