ORIGINAL ARTICLE

Asymptomatic Bacteriuria in Pregnant Women from Rural Area of Latur District of Maharashtra, India

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Abstract:

Background: Bacteriuria is a significant cause of morbidity in pregnant women affecting both mother and fetus. Institution of rational antibiotic treatment on the basis of screening helps to reduce further morbidity. *Aim and Objectives:* To find out the prevalence of urinary tract infections in asymptomatic pregnant women and to study the antimicrobial susceptibility pattern of the isolated bacteria to guide the treatment. *Materials and Methods:* A total of 100 mid-stream urine samples from Asymptomatic Antenatal Care (ANC) cases were screened for significant bacteriuria by using standard procedures. The bacterial isolates were subjected to antimicrobial susceptibility studies. *Results:* Significant bacteriuria was found positive in 23% cases. It was more common in the age group 18 to 25 years (91.30%), and during 2nd trimester (47.82%). *S. aureus* (82.60%) was found to be the most common uropathogen. Imipenem and meropenem (82.60% each) were found to be most effective antimicrobial agents. *Conclusion:* The results indicate that there is a notable increase in the prevalence of uropathogens resistant to multiple antimicrobial agents in rural areas also. The results also emphasize the importance of screening for significant bacteriuria in asymptomatic pregnant women.

Keywords: Asymptomatic Bacteriuria, Pregnancy, Antimicrobial Resistance

Introduction:

Pregnancy is one of the important factors predisposing to Urinary Tract Infections (UTIs). Pregnancy gives rise to several physiological changes resulting in immunosupression that may be responsible for increased incidence of infection. Pregnant women are at increased risk of UTIs due to mechanical factors, hormonal changes, urinary stasis and reflux of urine from bladder to ureters [1-2]. UTIs may lead to significant morbidity for both mother and fetus. Bacteriuria is a significant risk factor for developing pyelonephritis in pregnant women which increases the risk of preterm labor that may result in premature delivery and low birth weight with high perinatal morbidity and mortality [3]. Therefore, screening for bacteriuria during pregnancy irrespective of whether patient is symptomatic or not is important in first care setting as early treatment can prevent subsequent complications. Screening for Asymptomatic Bacteriuria (ASB) in pregnant women has been shown to be cost effective when compared with treating UTI and pyelonephritis without screening. Antibiotic treatment of ASB has also been shown to be associated with decreased incidence of low birth weight. If causative bacteria are detected in urine in significant number, pregnant women are to be treated, even if symptoms are not present. The present study was undertaken to evaluate the prevalence of UTIs in asymptomatic pregnant women, and to review the antimicrobial agents that can be used for the treatment purpose.

Material and Methods:

A total of 100 mid-stream urine samples from asymptomatic Antenatal Care (ANC) cases from the age group 18 years to 41 years, from varying gravid and of all three trimesters attending Outpatient Department (OPD) of Obstetrics and Gynaecology, Yashwanrao Chavan Rural Hospital and Maharashtra Institute of Medical Sciences & Research (MIMSR) Medical College Latur, Maharashtra, India were included. Clean catch midstream urine about 20 ml was collected in a sterile universal container. The G* power version 3.1.9 freeware was used for sample size calculation. The sample size of 200 (100 asymptomatic and 100 symptomatic cases) was considered sufficient for this study.

The specimens were inoculated by standard loop technique on Blood agar and MacConkey agar. A calibrated loop (with internal diameter of three mm delivering 0.001 ml of urine) was used. The plates were incubated at 37^0C for 18 - 24 hours in an incubator. After incubation, colonies were counted on each plate and the number of bacteria present in urine was calculated by multiplying the number of colonies by 1000. Specimens of urine showing counts $>10^5$ CFU/ml were considered as significant bacteriuria. The morphology of each different type of colony was noted and each colony was processed further for identification using standard procedure [4].

The antimicrobial susceptibility pattern of each isolate was studied by Kirby-Bauer disc diffusion method [5] using amikacin (30 µg), ceftazidime (30 µg), gentamicin (30 µg), ciprofloxacin (5 µg), tetracycline (30 µg), nitrofurantoin (300 µg), norfloxacin (10 µg), nalidixic acid (30 µg),imipenem (10 µg), meropenem (10 µg) and cefoxitin (30 µg). The organism was reported as susceptible or resistant according to the guidelines of Clinical and Laboratory Standards Institutes (CLSI) (document M100-S23) [6]. Nalidixic acid and nitrofurantoin were used against Gram-negative bacteria only. However, cefoxitin and tetracycline were used against Gram-positive bacteria only. The exact binomial test was used for statistical analysis.

Results:

In the present study, out of 100 asymptomatic cases, 23 cases (23%) were found positive for significant bacteriuria. Out of 23 positive cases, 21 (91.30%) were from the 18-25 years of age group and two cases (8.70%) were from 26-33 years of age group (Table 1). The occurrence of significant bacteriuria in younger age group (18-25 years) was found significantly higher in exact binomial test. Significant bacteriuria was found to be more common during 2nd trimester (47.82%), followed by 3rd trimester (39.13%) and 1st trimester (13.04%) (Table 2).

S. aureus (82.60%) was found to be the most common uropathogen isolated followed by *Klebsiella* spp. (13.04%) and Micrococci (4.35%) (Table3). The infection was monomicrobial and no mixed infection was found in any of the cases. This distribution of uropathogens was found to be statistically significant (X-squared = 25.3912, df = 2, p-value = 3.065e-06).

The results of antimicrobial susceptibility testing showed that imipenem and meropenem (82.60% each) were most effective antimicrobial agents followed by gentamicin (73.91%), nalidixic acid (66.66%) and amikacin (65.21%). Ceftazidime (39.13%), ciprofloxacin and norfloxacin (47.82% each) were found to be less effective antimicrobial agents (Table 3).

Table 1: Age Group-Wise Distribution of Cases of Significant Bacteriuria among Asymptomatic Groups

Age Group in Years	Number of Cases Positive for Significant Bacteriuria	Percentage
18-25 years	21	91.30
26-33 years	02	08.70
34-41 years	00	0.00
Total	**23**	**100**

Table 2: Pattern of Uropathogens Isolated from Cases of Asymptomatic Group

Name of uropathogen	Number of Isolates
Staphylococcus aureus	19 (82.60%)
Klebsiella spp.	03 (13.04%)
Micrococci	01 (4.35%)
Total	**23 (100%)**

Table 3: Antibiogram of Uropathogens Isolated from Asymptomatic Group

Name of the organism	No. of isolates	Antimicrobial agents (No. and percentage)										
		AK	**NIT**	**NOR**	**NA**	**G**	**CIP**	**CN**	**T**	**I**	**MR**	**CAZ**
S. aureus	19	12 (63.15)	-	10 (52.63)	-	14 (73.68)	10 (52.63)	02 (10.52)	09 (47.36)	15 (78.94)	15 (78.94)	07 (36.84)
***Klebsiella* spp.**	03	02 (66.66)	03 (100.0)	01 (33.33)	02 (66.66)	02 (66.66)	01 (33.33)	-	-	03 (100.0)	03 (100.0)	01 (33.33)
Micrococci	01	01 (100.0)	-	0	-	01 (100.0)	0	0	01 (100.0)	01 (100.0)	01 (100.0)	01 (100.0)
Total	23	15 (65.21)	3/3 (100.0)	11 (47.82)	2/3 (66.66)	17 (73.91)	11 (47.82)	2/20 (10.00)	10/20 (50.00)	19 (82.60)	19 (82.60)	09 (39.13)

Note: Figures in parentheses indicate percentage

AK- amikacin, NIT-nitrofurantoin, NOR-norfloxacin, NA-nalidixic acid, G-gentamicin, CIP-ciprofloxacin, CN-cefoxitin, T-tetracycline, I-imipenem, MR-meropenem, CAZ-ceftazidime

Discussion:

Pregnancy is a unique state with anatomical and physiological changes predisposing to UTIs. Although, asymptomatic bacteriuria in non-pregnant women is generally benign, it is a common cause of serious maternal and perinatal morbidity including development of pyelonephritis, premature labour, LBW, stillbirth, abortion and impaired intrauterine development in pregnant women [3,7]. Hence, screening for ASB in pregnancy and its appropriate treatment based on culture results have become a part of standard obstetric care to avoid further morbidity by avoiding persistent bacteriuria [8].

In the present study the overall prevalence rate of significant bacteriuria was found to be 23% and it was found more common (91.30%) in 18-25 years of age group. The prevalence rate of 23% is more or less similar with earlier workers [9-11]. However, this rate appears to be much higher than other earlier studies [12-17] and much lower than Rizvi *et al.* (74.8%) and Sabharwal (75%) [17,18]. This wide difference in the prevalence rates of significant bacteriuria in asymptomatic pregnant women may be attributed to environmental conditions, socio-economic status, varied distribution of bacterial pathogens causing UTIs, urogenital hygiene and sexual practices.

The findings of more prevalence rate (91.30%) of significant bacteriuria in the age group 18-25 years in asymptomatic group in the present study does not correlate with earlier findings [9, 13, 14]. The occurrence of significant bacteriuria in younger age group (18-25 years) in our study was found significantly higher in exact binomial test and it is not at all in agreement with earlier workers, which report higher prevalence rates in the older age groups. We do agree that age is one of the important predisposing factors and prevalence of significant bacteriuria increases with age but why the results are exactly opposite to this are difficult to explain. Most probably frequent sexual activities might be the factor responsible for these findings in addition to personal and urogenital hygiene.

Among the 23 positive cases, significant bacteriuria was more common during 2nd trimester (47.82%) followed by 3rd trimester (39.13%) and 1st trimester (13.04%). This finding fairly correlates with Kehinde *et al.* [19], Boye *et al.* [20], Obirikorang *et al.* [21] and Titoria *et al.* [22]. These studies have also reported more common occurrence of significant bacteriuria during 2nd trimester. However, the findings of present study are different from other studies, which report more common occurrence of significant bacteriuria either during 3rd trimester or 1st trimester [9, 10, 17]. Comparatively higher occurrence of significant bacteriuria during 2nd and 3rd trimesters in the current study may be attributed to the anatomical and physiological changes such as expansion of uterus and hormonal changes making the environment favorable for microbial invasion.

It has been proved beyond doubt that *E. coli* is the most common bacterium causing UTIs and it has been reported as the most common isolate in majority of the studies reported so far. But in some exceptional studies, predominance of bacteria other than *E. coli* has been reported [10, 23-25]. The findings of the present study are also exceptional in which *S. aureus* was found to be more common isolate than *E. coli*. These results show that there is decline in the frequency of *E. coli* as an etiological agent in the asymptomatic group in this study and increase in the frequency of other organisms like *S. aureus* and *Klebsiella* spp.

In our study, imipenem and meropenem (82.60% each) were found to be most effective antimicrobial agents. Nitrofurantoin (100%) was found most effective against *Klebsiella* spp. However, gentamicin (73.91%), nalidixic acid (66.66%) and amikacin (65.21%) were showed comparatively better activity and ceftazidime (39.13%), ciprofloxacin and norfloxacin (47.82% each) were found least effective agents against uropathogens isolated from asymptomatic group. Imipenem and meropenem for susceptibility studies against uropathogens isolated from asymptomatic group have been rarely used. We could find only one study reporting imipenem (100%) most effective against uropathogens from asymptomatic pregnant women (Ojide *et al.* 2014) [26]. The findings of present study of imipenem as most effective agent fairly correlates with this study.

Nitrofurantoin (100%) was found highly effective against *Klebsiella* spp. in our study. This finding in general is quite similar to most of the earlier studies, who also reported nitrofurantoin as one of the most effective agents against uropathogens isolated from asymptomatic group of pregnant women [15, 27-31]. Gentamicin (73.91%) in our study was also found quite effective against most of the uropathogens. This finding is quite similar to most of the earlier studies [9, 11, 12, 16, 20, 29].

Rest of the antimicrobial agents in our study were found effective against less than 70% of uropathogens with ceftazidime, ciprofloxacin and norfloxacin showing least effective activity. These findings are more or less similar to some of the earlier studies, however not in concordance with some other studies in which antimicrobial agents like ciprofloxacin, norfloxacin or ceftazidime have been reported highly effective against uropathogens [11-13, 15, 16, 27, 29].

Conclusion:

The overall results of present study indicate that there is a notable increase in the number of uropathogens resistant to amikacin, norfloxacin, gentamicin, ceftazidime and ciprofloxacin in general in all uropathogens and to nitrofurantoin and nalidixic acid in Gram-negative bacteria and to cefoxitin and tetracycline in Gram-positive isolates as compared to most of the earlier studies. These findings fairly correlate with the current view that there is significant increase in the resistance in uropathogens commonly associated with UTIs.

These results of antibiotic susceptibility pattern also show that there is a vast difference in susceptibility pattern of uropathogens of current study as compared to the most of the earlier studies. These results indicate that susceptibility pattern varies from hospital-to-hospital, population-to-population and country-to-country and signifies the importance of study of susceptibility pattern, as emphasized by various international authorities that every hospital should have its own antimicrobial susceptibility pattern as the standard antimicrobial susceptibility pattern may not hold true for every area/hospital. The increased prevalence of uropathogens resistant to multiple antimicrobial agents in rural areas also shows the need for the increased surveillance for better understanding of the infecting agents and its susceptibility pattern.

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