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Full Length Research Paper

Prevalence of multidrug resistant asymptomatic bacteriuria from pregnant and non-pregnant women in the Erode district

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Asymptomatic bacteriurias (ASB) during pregnancy are among the commonest health problems world-wide, especially in developing countries, including India. In this view, the present study was undertaken to determine the prevalence of multidrug resistant asymptomatic bacteriuria from pregnant and non-pregnant women in the Erode district. A total of 35 were positive for significant bacteriuria. It was noted that asymptomatic bacteriuria were high in pregnant women as compared to non-pregnant women. Out of 35 positive samples, highest prevalence of bacteriuria was observed in pregnant women (10) than in non-pregnant women (4) within the 24-28 years age group. Microscopic examination of urine samples revealed the presence of 25 leukocytes, 18 erythrocytes, 22 epithelial cells, 14 crystal and 2 yeast cells respectively. Effect of pathogenic bacteria on ASB was studied and it was found that *Escherichia coli* cause the highest percentage of infection (42.85%) in pregnant women than in non-pregnant women (11.42%). The isolated ASB showed resistance to tetracycline (80%), chloramphenicol (71%) and ampicillin (65%), and was sensitive to nitrofurantoin (11%), amikacin (13%) and cefotizoxime (16%).

Key words: Asymptomatic bacteriurias, pregnancy, infection.

INTRODUCTION

Urinary tract infections (UTIs) are the second most common infections in community practice of human, especially in female. In India, more than 80% women get infected by UTI at least once in their life period and it is 30 times more than in men (Kucheria et al., 2005). UTIs are more common in pregnant than in non-pregnant women (Stamm et al., 1993). In healthy individuals, the freshly collected urine is sterile and free from microorganisms. But urinary tract infections caused by a variety of microbes leads to serious problems which may be complicated or uncomplicated, symptomatic or asymptomatic in nature (Shamweel et al., 2011). Asymptomatic bacteriuria (ASB) is defined as presence of a significant quantity of bacteria in the urinary tract excluding the distal urethra in a patient without any obvious symptoms (Paul et al., 2010). In other terms, it is a condition in which urine culture reveals a significant growth of pathogens that is greater than 10^5 bacteria/milliliters of same species, but without the patient showing symptoms in urinary tract (Patterson and Andriole, 1997). Several studies have shown the overall prevalence of ASB in pregnancy to be between 6-13% and similar to that observed in non-pregnant women (Obirikorang et al., 2012).

This is the major cause for urinary tract infections in females and the mostly prevalent in pregnant women than in non-pregnant women (Ali and Gholemreza, 2009). Conditions associated with increased incidence include the combination of mechanical, hormonal and physiological changes during pregnancy which contributes to significant changes in the urinary tract which has a profound impact on the acquisition and natural history of bacteriuria during pregnancy (Fatima and Ishrat, 2006). Low socio-economic status, pregnancy

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trimester, gravidity, parity and history of previous urinary tract infections are a cause for two-fold increase in the rate of bacteriuria in pregnancy (Kiningham, 1993). Asymptomatic bacteriuria could lead to serious complications in pregnant women if untreated (Enayat et al., 2008). It has several adverse outcomes not only on the mother but also on the foetus as well (Marahatta et al., 2011). The significance of asymptomatic bacteriuria in pregnancy lies in its potential to cause acute pyelonephritis. Others include anaemia, preeclampsia and even foetal wastage (Macejko and Schaeffer, 2007).

The etiologic agents associated with ASB are similar in pregnant and non-pregnant women and the leading causes of acute and uncomplicated UTI have been reported to be due to *Escherichia coli* (80-90%) and the rest are caused by *Proteus mirabilis, Klebsiella pneumonia* and *Pseudomonas aeruginosa* (Obiogbolu et al., 2009). Gram-positive organisms are even less common in which Group B Streptococcus, *Staphylococcus saprophyticus* and *Staphylococcus haemolyticus* are recognized organisms (Ugbogu et al., 2010).

METHODOLOGY

Urine collection

Two hundred and fifty urine samples were collected by clean catch methodology (Macejko and Schaeffer, 2007) in sterile disposable bottles from a healthy non-pregnant and pregnant woman. The samples were labelled, transported to the microbiology laboratory and were analyzed within one hour of collection.

Microscopic examination

The 10 ml of urine samples were centrifuged at 1,000 rpm for 5 min. A drop of the resulting sediment was transferred to a clean glass slide and examined for pus cells, red blood cells, epithelial cells, crystals and yeast-like cells under microscope using standard criteria (Strasinger, 1985).

Sampling and bacteriological analysis

A total of 0.01 ml of urine sample was plated onto MacConkey agar, 5% sheep blood agar plates by spread plate technique (Strasinger et al., 1985). The streaked plates were incubated at 37°C for 24 h. After 24 of the incubation colonies were counted on each plate, the number of CFUs was multiplied by 100 to determine the number of microorganisms per millilitre in the original specimen. The microorganisms were identified according to standard bacteriologic procedures.

Sensitivity tests

Antibiotic sensitivity testing was done by emulsifying selected isolates in normal saline at a turbidity compared to 0.5 Mac Farland's standard (Zalmanovici et al., 2010). Using sterile swabs, suspensions were inoculated on Muller-Hinton agar and antibiotic discs such as: Amk - Amikacin, Nit - Nitrofurantoin, Ct - Cefotizoxime, C - Chlerophenicol, Cip - Ciprofloxcin, AM - Ampicillin, G - Gentamycin, T - Tetracycline, were impregnated on the medium and incubated at 37°C for 24 h. After incubation interpretation was done, the diameter of zone of inhibition was compared with those of a standard table in three grades of susceptibility which are sensitive, intermediate and resistant.

RESULTS

A total of 250 women urine samples were collected from 125 pregnant women and 125 non-pregnant women and screened for significant, asymptomatic bacteriuria by the urine culture method. Out of the 250 samples, 35 (9.72%) samples showed the presence of asymptomatic bacteriuria in the present study population, of which twenty-five are from the pregnant women (17.5%) and ten are from the non-pregnant women (5.71%). Out of the 35 positive samples, highest prevalence of bacteriuria was observed within the 24-28 years age group followed by the 29-32 years age group, 19-23 years age group and 33-36 years age group respectively (Table 1).

Microscopic examination of urine samples

Microscopic field which contained more than five leukocytes (WBCs) or erythrocytes (RBCs) were taken as positive. Microscopic examination of urine samples revealed that 25 (71.42%) were leukocytes, while 18 (51.42%) were erythrocytes, 22 (62.85%) were epithelial cells, 14 (40%) were crystal and 2 (5.71%) were yeast respectively.

Causative agents

The most common bacteria isolated from the culture of the urine samples of the pregnant and non-pregnant women with asymptomatic bacteriuria were identified based on colony morphology, Gram staining reaction and biochemical tests. The frequency of the microorganisms isolated is shown in Table 2. *Escherichia coli* (54.28%) represented the most frequently isolated pathogen followed by *Staphylococcus aureus* (28.57%), *Klebsiella pneumoniae* (20.00%), *Proteus mirabilis* (14.28%) and *Pseudomonas aeruginosa* (5.71%) respectively.

Antibiotic susceptibility tests

The antimicrobial susceptibility pattern to commonly used antibiotics varied in different studies. The antibiotic sensitivity patterns showed that most of the bacterial isolates were sensitive to nitrofurantoin, gentamicin and

Table 1. Prevalence of asymptomatic bacteriuria in the study population based on age distribution.

S/N	Age (Years)	No. of positive from pregnant women (n=125)	No. of positive from non-pregnant women (n=125)	Total (%) (n=250)
1	19-23	5	1	6
2	24-28	10	4	14
3	29-32	5	3	8
4	33-36	4	2	6
5	37-40	1	0	1
	Total	25	10	35

Table 2. Pathogenic bacteria isolated from pregnant and non-pregnant women.

Isolates	No. of isolates from pregnant women (%)	No. of isolates from non-pregnant women (%)	Total (%)
E. coli	15 (42.85)	4 (11.42)	19(54.28)
Staphylococcus aureus	8 (23.52)	2 (5.71)	10(28.57)
Klebsiella pneumonia	6 (17.14)	1 (2.85)	7 (20.00)
Proteus mirabilis	4 (11.42)	1 (2.85)	5 (14.28)
Pseudomonas aeruginosa	2 (5.71)	0 (0)	2(5.71)

Table 3. The results of the disk diffusion testing for the antibiotic susceptibility.

Isolates	Amk	Nit	Ct	C	Cip	Am	G	T
E. coli (n=15)	3 (R)	1 (R)	1 (R)	13 (R)	3 (R)	11 (R)	3 (R)	14 (R)
S. aureus (n=8)	1 (R)	2 (R)	3 (R)	4 (R)	2 (R)	4 (R)	2 (R)	4 (R)
K. pneumonia (n=6)	0 (R)	1 (R)	1 (R)	5 (R)	1 (R)	4 (R)	1 (R)	4 (R)
P. mirabilis (n=4)	1 (R)	0 (R)	1 (R)	2 (R)	0 (R)	3 (R)	1 (R)	3 (R)
P. aeruginosa (n=2)	0 (R)	0 (R)	0 (R)	1 (R)	0 (R)	1 (R)	0 (R)	1 (R)
Total = 35	5 (13%)	4 (11%)	6 (16%)	25 (71%)	6 (17%)	23 (65%)	7 (20%)	28 (80%)

Note: Amk - Amikacin, Nit - Nitrofurantoin, Ct - Cefotizoxime, C - Chlerophenicol, Cip - Ciprofloxcin, AM - Ampicillin, G - Gentamycin, T - Tetracycline.

ciprofloxacin. On the other hand, *Escherichia coli, Staphylococcus aureus, Klebsiella pneumonia, Proteus mirabilis* and *Pseudomonas aeruginosa* were highly resistant to tetracycline, ampicillin and chloramphenicol (Table 3).

Prevalence of disease

In this study culture, positive cases with respect to trimester are as follows: first trimester is 3 (8.57%), second trimester is 9 (25.71%) and third trimester is 12 (34.28%) respectively. Regarding parity, highly significant prevalence of ASB observed in pregnant and non-pregnant women was 1-2 (51.42%) and 3-4 (22.85), respectively. The distributions of parity, history of previous UTIs, education, place of living and socio-economic status were similar between the pregnant and non-pregnant women.

DISCUSSION

Urinary tract infections are caused by bacteria and are 10 times more common among women than men (Abyad, 1991). In this study, out of the total 250 pregnant and non-pregnant women, 35 were found positive for significant bacteriuria giving a prevalence of 9.72%. The prevalence of asymptomatic bacteriuria in pregnant women in this study was 17.5%. This was close to the average of prevalence found in previous studies, which varied from 8.1 to 21% (Forbes et al., 1998). It was reported to be as high as 23.9% in a study from Sagamu, Nigeria and 45.3% in another study from Benin City, Nigeria (Olusanya et al., 1993). It is lower than the 6.1% earlier reported in Srinagar, India (Shamweel Ahmad et al., 2011) and 5% reported in Faisalabad, Pakistan (Aziz et al., 2006). This high incidence highlights the size of the problem which necessitates a rapid interference

especially asymptomatic urinary tract infection. In this study, prevalence of asymptomatic bacteriuria was found to be 17.5%, which is in agreement with others (Akinola et al., 2012). Our study clearly demonstrated that frequency of positive urine culture in total pregnant and non-pregnant women were 28 (17.5%) and 8 (5.71%), respectively. The highest prevalence of 33.33% was recorded in the age-group of 26-30 years and the lowest rate of 2.77% was recorded among the age-group of 40 years. No case of bacteriuria was recorded below the 16 years age group. Pregnant and non-pregnant women have a similar prevalence. Our study represents no significant difference of ASB in pregnant and non-pregnant women. Our results are in agreement with those of Olusanya et al. (1993) who reported that during pregnancy the prevalence of infection does not change, but there are some variations in the pathogenesis. This study demonstrated that increasing age was not associated with an increase in prevalence of bacteriuria. The microbiology of bacteriuria in this study is similar to that of most reported studies. *Escherichia coli* are the most common pathogen in ABU in pregnant women varying in most previous studies. In this study, the etiologic agent *Escherichia coli* was the most frequent (54.28%) which is in agreement with similar reported studies in our country as well as in other parts of the world (Ali and Gholemreza, 2009). In our study, pregnant women in their second and third trimester were found to have the higher incidence of ASB; 25.71% and 34.28% respectively. While in their early month of the pregnancy (First trimester), they had low ASB (8.57%). These studies observed high risk factors for acquiring UTI during pregnancy. This increased incidence of ASB in 2nd and 3rd trimester was found in concordant with several studies (Turpin et al., 2007). This study further observed that pregnant women in the second trimester of pregnancy had the highest prevalence of asymptomatic bacteriuria followed by pregnant women in the third trimester of pregnancy which is in consonance with the findings of Marahatta et al. (2011) who in a study on bacterial urinary tract infection among pregnant women in Iran reported the second and third trimesters of pregnancy as being associated with the highest prevalence of UTI. The prevalence of ABU increases from 1st, 2nd, and 3rd trimester as 0.9, 1.83, and 5.6%, respectively (Enayat et al., 2008), while 5.9, 8.2 and 15.9% in southern region of Thailand (Girishbabu et al., 2011). The antimicrobial susceptibility pattern to commonly used antibiotics varied in different studies. The antibiotic sensitivity patterns showed that most of the bacterial isolates were sensitive to nitroforantoin, gentamicin and ciprofloxacin. On the other hand,

Escherichia coli, Staphylococcus aureus, Klebsiella pneumonia, Proteus mirabilis and *Pseudomonas aeruginosa* were highly resistant to tetracycline, ampicillin and chloramphenicol (Obirikorang et al., 2012). However, the data were insufficient to confirm the preference of a single dose or longer duration doses in treating asymptomatic bacteriuria in pregnant women. In view of changing pattern of bacterial resistance to common drugs, the importance of educating physicians to use these antibiotics for empiric therapy is important. The choice of antibiotic should however be based on urine culture, stage of gestation, clinical data and the characteristics of the antibiotic (Patterson and Andriole, 1997).

Conclusion

Outcome of the current community based study showed that the asymptomatic bacteriuria in pregnancy is a foremost health problem in Erode. The major organisms are *Escherichia coli*, *Klebsiella pneumonia*, *Staphylococcus aureus* and *Proteus mirabilis*. Age, parity, gestation, education level, and recent socioeconomics were absolutely allied with ASB in these people in our vicinity. The choice of antibiotic must be based on urine culture, stage of gestation, maternal clinical data and the physiognomies of the antibiotic.

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