Section: Microbiology

Original Research Article

STUDY OF ASYMPTOMATIC BACTERIURIA IN PREGNANT WOMEN AND ANTIBIOTIC SUSCEPTIBLITY PATTERN IN PATIENTS ATTENDING DMC, A TERTIARY CARE HOSPITAL, DARBHANGA, BIHAR

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Abstract

Background: The aim of this study was to observe the prevalence and risk factors of ASB, common microorganisms isolated and antibacterial susceptibilities of the isolated microorganisms among pregnant women who attended the tertiary care centre. **Materials and Methods:** This cross-sectional study was carried out in the Microbiology department, DMC, Lehariasari, Bihar. This study conducted for 1 year from July 2023 to June 2024. Ethical clearance for study was obtained from the Institutional Ethics Committee. Informed consents were taken from all participating pregnant women. The midstream urine samples were taken for urinalysis and culture was done on CLED (cysteine lactose electrolyte deficient) medium or MacConkey agar and blood agar employing standard loop method (i.e. 1 ul volume loop)9 . Women having > 105 colony forming units/ml of single organism were diagnosed positive for ASB and treated [10]. The standardized Kirby Bauer disc diffusion method as per the Clinical and Laboratory Standards Institute (i.e. CLSI) guideline was used for antibiotic susceptibility testing and interpretations were carried out accordingly. **Result:** Among 460 pregnant women who were examined for ASB, significant bacteriuria was observed in 46 cases, giving a prevalence of 10%. The dominant bacteria were E. coli (52.17%) followed by Klebsiella pneumoniae (21.73%), Staphylococcus aureus (17.39%) and Enterococcus faecalis (8.69%) respectively. The antibiotic susceptibilities of the isolates are mentioned in table 3. E.coli, the commonest isolate, was found to be sensitive to cotrimoxazole (41.67% sensitivity) and to nalidoxic acid (50% sensitivity). Seventy five percent sensitivity was observed for doxycycline and ciprofloxacin. Sensitivity to nitrofurantoin and gentamicin was 83.33% and sensitivity to cefepime and amikacin was 91.67%. Hundred percent sensitivity was found for imipenem. **Conclusion:** In this study, the prevalence of asymptomatic bacteriuria among pregnant women was 10. The predominant organisms are E.coli and most isolates are sensitive to amino glycosides and imipenem. In view of changing patterns of bacterial resistance to common drugs, it is important to educate physicians on use of antibiotics and not to provide empirical therapy.

INTRODUCTION

Asymptomatic bacteriuria (ASB or Asymptomatic Significant bacteriuria) is defined as the presence of actively multiplying bacteria in the urinary tract, excluding the distal urethra, in a patient without obvious urinary symptoms.[1] The prevalence during pregnancy is similar to that in non-pregnant women and varies from 4% to 7%.[2,3] Prevalence of ASB increases with lower socioeconomic classes, past history of asymptomatic urinary tract infection, high parity and age.[4,5] ASB is a microbial diagnosis based on the isolation of a specified quantitative number of bacteria in urine specimen. So urine culture is the gold standard for screening of ASB. Escherichia coli are isolated in almost 60%-90% ASB in pregnant women in different studies carried out all over the world, at different periods of time. Other common agents include Proteus mirabilis, Klebsiella pneumoniae, Enterococcus, Group B beta-haemolytic streptococci, Staphylococcus saprophyticus etc.[6,7] The frequencies of isolated

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pathogens and their antimicrobial susceptibility patterns can vary in different geographical areas. It is important to identify the commonest pathogens in a particular locality and the community should be made aware regarding the antimicrobial susceptibility patterns of those organisms. So, the aim of this study was to observe the prevalence and risk factors of ASB, common microorganisms isolated and antibacterial susceptibilities of the isolated microorganisms among pregnant women who attended the tertiary care centre.

MATERIALS AND METHODS

This cross-sectional study was carried out in the Microbiology department, DMC, Lehariasari, Bihar. This study conducted for 1 year from July 2023 to June 2024. Ethical clearance for study was obtained from the Institutional Ethics Committee. Informed consents were taken from all participating pregnant women. Women at any gestational age attending the antenatal clinic for their first visit were included and those women having a history of urinary tract symptoms (dysuria, frequency, and urgency, etc), antibiotic administration within the previous 7 days, pyrexia of unknown origin and recurrent UTI were excluded from the study. The minimal sample size was estimated to be 460 (with 5 percent absolute error at 95 percent confidence interval and adding 10% attrition rate) considering the prevalence rate of ASB about 16 percent from the previous study in Northern Indian women.[8] By using systematic sampling method the women were selected. Previous antenatal records showed that an average of 460 pregnant women visited 1st time in antenatal outpatient department within year. This annual number was divided by the minimum sample size (226) to get a sampling fraction of 19.[9] Some women may not give consent although it fulfills the inclusion criteria and therefore sample was taken after the interval of every 15 women though sampling fraction was 19. The midstream urine samples were taken for urinalysis and culture was done on CLED (cysteine lactose electrolyte deficient) medium or MacConkey agar and blood agar employing standard loop method (i.e. 1 ul volume loop).[9] Women having > 105 colony forming units/ml of single organism were diagnosed positive for ASB and treated.[10] The standardized Kirby Bauer disc diffusion method as per the Clinical and Laboratory Standards Institute (i.e. CLSI) guideline was used for antibiotic susceptibility testing and interpretations were carried out accordingly.[11]

A structured proforma was used to obtain data. The data obtained consist of age, address, educational status, parity, gestational age, history suggestive of urinary tract infection (dysuria, frequency, fever, suprapubic and loin pain), history of antibiotics use, culture and sensitivity result. Data were presented as numbers and percentages in tables. Chi square or Fisher's exact tests were used to test for associations. Significant association was presumed if $P < 0.05$.

RESULTS

Among 460 pregnant women who were examined for ASB, significant bacteriuria was observed in 46 cases, giving a prevalence of 10%. Table 1 shows the influence of age, parity, locality, educational status and gestational age of the participants on ASB. The maximum rate of 10.40% was found in the 20-30 years age group and minimum rate of 7.69% in >30 years group. The relationship of prevalence among the age group is not statistically significant (chi-square value=0.1488, df=2, p=0.9283). Among significant bacteriuria positive women, highest prevalence was observed in nulliparous women (11.81%) whilst the women having one or two child had the least prevalence. However no significant relationship was found between parity and prevalence (χ 2 = 1.038, df=2, p=0.5950). The pregnant women who resided in rural areas were more likely to have ASB and it is statistically significant (p=0.8892).

Table 1: Prevalence of asymptomatic bacteriuria among pregnant women.

Variables	Significant bacteriuria N=46 (%)	No significant bacteriuria N=414 (%)	Total number of cases N=460 (%)	χ 2	Df	P value
Age in years						
<20	8(9.09%)	80(90.91%)	88(19.13%)	0.1488	2	0.9283
20-30	36(10.40%)	310(89.60%)	346(75.21%)			
>30	2(7.69%)	24(92.31%)	26(5.65%)			
Parity						
0	30(11.81%)	224(88.19%)	254(55.21%)	1.038	2	0.5950
1-2	14(7.69%)	168(92.31%)	182(39.56%)			
>3	2(8.33%)	22(91.67%)	24(5.21%)			
Locality						
Rural	42(13.04%)	280(86.96%)	322(70.00%)	4.454	1	0.0348*
Urban	4(2.89%)	134(97.11%)	138(30.00%)			
Literacy						
Illiterate	6(9.09%)	60(90.91%)	66(14.34%)	0.2397	3	0.9709
Primary	20(10.64%)	168(89.36%)	188(40.86%)			
High school	16(10.39%)	138(89.61%)	154(33.47%)			
Higher education	4(7.69%)	48(92.31%)	52(11.30%)			
Gestational age						
1st	6 (8.11%)	68(91.89%)	74(16.08%)	0.2349	2	0.8892
2nd	18(10.98%)	146(89.02%)	164(35.65%)			

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3rd	22(9.91%)	200(90.09%)	222(48.26%)			

Table 2: Bacterial isolates among pregnant women with significant bacteriuria

Bacterial isolates	No. of women with isolates	Percentage (%)
Escherichia coli	24	52.17
Staphylococcus aureus	8	17.39
Enterococcus faecalis	4	8.69
Klebsiella pneumoniae	10	21.73
Total	46	100

Table 3: Antimicrobial susceptibility pattern

Drugs	Escherichia coli		Staphylococcus aureus		Enterococcus faecalis		Klebsiella pneumoniae	
	No. of isolates	Percentage (%)	No. of isolates	Percentage (%)	No. of isolates	Percentage (%)	No. of isolates	Percentage (%)
Ciprofloxacin	18	75	8	100	0	0	8	80
Nitrofurantoin	20	83.33	ND	-	2	50	8	80
Nalidoxic acid	12	50	ND	-	ND	-	6	60
Cefepime	22	91.67	6	75	ND	-	10	100
Amikacin	22	91.67	6	75	4	100	10	100
Ampicillin	14	58.33	ND	-	2	50	6	60
Amoxicillin	16	66.67	4	50	4	100	8	80
Cotrimoxazole	14	41.67	6	75	2	50	6	60
Doxycyclin	18	75	4	50	4	100	8	80
Azithromycin	ND	-	8	100	4	100	ND	-
Gentamicin	20	83.33	ND	-	4	100	10	100
Tobramycin	ND	-	ND	-	ND	-	10	100
Vancomycin	ND	-	8	100	4	100	ND	-
Imipenem	24	100	8	100	ND	-	10	100

ND = Not Done

The bacterial isolates are shown in [Table 2]. The dominant bacteria were E. coli (52.17%) followed by Klebsiella pneumoniae (21.73%), Staphylococcus aureus (17.39%) and Enterococcus faecalis (8.69%) respectively. The antibiotic susceptibilities of the isolates are mentioned in [Table 3]. E.coli, the commonest isolate, was found to be sensitive to cotrimoxazole (41.67% sensitivity) and to nalidoxic acid acid (50% sensitivity). Seventy five percent sensitivity was observed for doxycycline and ciprofloxacin. Sensitivity to nitrofurantoin and gentamicin was 83.33% and sensitivity to cefepime and amikacin was 91.67%. Hundred percent sensitivity was found for imipenem.

Klebsiella pneumoniae, the second most frequent isolate, was 60% sensitive to nalidoxic acid, ampicillin and cotrimoxazole. Sensitivity to amoxicillin, ciprofloxacin, nitrofurantoin and doxycyclin was 80% and that for cefepime, amikacin, gentamicin, tobramycin and imipenem was 100%.

All the Staphylococcus aureus isolates were sensitive to ciprofloxacin, azithromycin, vancomycin and imipenem; two (50%) were sensitive to amoxicillin and doxycycline and three (75%) were sensitive to cefepime, amikacin and cotrimoxazole. All isolates of Enterococcus faecalis were sensitive to amoxicillin, amikacin, doxycyclin, gentamicin, azithromycin, vancomycin; no one was sensitive to ciprofloxacin, one to ampicillin, nitrofurantoin and cotrimoxazole.

DISCUSSION

In this study, the prevalence of asymptomatic bacteriuria in pregnant women was 10% which was almost similar to 9.5% reported from the study in Kumasi, Ghana.[12] It is lower than the 13.5% reported in Mangalore, Karnataka,[13] 17% reported in Nellore, India and 26% reported in Chitwan, Nepal.[14,15] This is higher than the 7.3% from the study in Kanpur, India.[16] The highest prevalence of 10.40% was recorded in the age-group of 20-30 years and the lowest rate of 7.69% among the >30 years age-group. There was no significant difference in the prevalence of ASB with respect to age group (P = 0.6597). In a study by Imade PE et al,[17] 1228 pregnant women were evaluated and maximum prevalence was observed between 20-30 years age group which is comparable to the present study. In a study performed in Ghana, 220 pregnant women were examined and the prevalence of ASB was reported maximum in the age group of >35 years which is in contrast with our findings.[18] In relation to parity, nulliparous women had a prevalence of 11.81% as against 7.69% in the parity of 1 or 2. The parity distribution in this study appeared not to have any significant effect on ASB. This study is similar to previous reports in Nigeria,[19] and Ghana.[12] However, this differed from some other study where ASB in pregnancy was associated with increasing parity.[20,21] Findings from the study reveal that the prevalence of ASB who resided in rural areas were significantly higher than urban area (χ 2 = 4.454, df=1, p=0.0348). A similar finding was observed in the study of Onu FA et al,[22] Using educational status as a parameter of socio-economic status, no significant association was found between asymptomatic bacteriuria and educational status. This finding was comparable with the study of Labi et al.[23] However, the finding was at variance with

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the observations from southeastern Nigeria, where ASB was mostly seen among the least educated women.[24] In this study, higher prevalence of ASB was seen in 2nd trimester of pregnancy, which was similar to that seen in the study of Nath et al.[25] Escherichia coli were the dominant organism in the study followed by Staphylococcus aureus. The other organisms isolated were Klebsiella pneumoniae and Enterococcus faecalis. This is similar to the findings in previous studies by Umamageswari, Chandel and Gayathree.[25-28] The maximum sensitivity to different antibiotics exhibited by uropathogens in this study were as follows: E. coli – 100% sensitive to imipenem; S. aureus – 100% sensitive to imipenem, vancomycin, azithromycin and ciprofloxacin; K. pneumoniae – 100% sensitive to imipenem, tobramycin, gentamicin, amikacin and cefepime; E. faecalis – 100% sensitive to vancomycin, azithromycin, gentamicin, doxycyclin, amikacin and amoxicillin. The uropathogens were least sensitive to nalidoxic acid, ampicillin, amoxicillin and cotrimoxazole. The reason behind resistance to these may be self medication, antibiotic abuse, low cost and availability of drugs. Though the sensitivity and resistance pattern of antibiotics varies from community to community and hospital to hospital due to indiscriminate use, but in various studies,[16,29] it has been observed that different uropathogens are still highly sensitive to imipenem and amino glycosides which is similar to our study.

CONCLUSION

In this study, the prevalence of asymptomatic bacteriuria among pregnant women was 10%. Apart from rural dwelling, demographic and obstetric parameters did not significantly influence the prevalence of asymptomatic bacteriuria. The predominant organisms are E.coli and most isolates are sensitive to amino glycosides and imipenem. In view of changing patterns of bacterial resistance to common drugs, it is important to educate physicians on use of antibiotics and not to provide empirical therapy.

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