

Asymptomatic Bacteriuria in Antenatal Patients in Ilorin, Nigeria

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Abstract

Objective: To determine the prevalence of asymptomatic bacteriuria, bacteriology and sensitivity pattern in Ilorin using the gold standard of urine culture.

Methods: A prospective study was carried out from 1st July to 31st October 2007, at the University of Ilorin Teaching Hospital (UITH) on 125 consenting asymptomatic pregnant women. A structured proforma was used to collect information from the women and a midstream urine specimen collected for bacteriological culture.

Results: Of the 125 pregnant women, 50 had bacteriuria on urine culture giving a prevalence of 40%. The mean age of the women was 28.5 years with a standard deviation of 4.95. The age ranged between 14 and 40 years. *Staphylococcus aureus* was the commonest pathogen isolated (72%), followed by *Proteus spp* (14%). Most of the organisms showed good sensitivity to Nitrofurantoin and gentamicin.

Conclusion: The prevalence of asymptomatic bacteriuria in Ilorin is high and routine urine culture is advocated for all pregnant women at booking.

Keywords: Asymptomatic bacteriuria; Pregnancy; Prevalence; Urine culture; Sensitivity.

Introduction

The urinary tract is second only to the respiratory tract in acquiring microbial infections, especially in females. Urinary tract infections (UTI) are more common in pregnant than non-

pregnant women.^{1,2} Asymptomatic bacteriuria (ASB) is defined as the presence of actively multiplying bacteria in the urinary tract excluding the distal urethra in a patient without any obvious symptoms.³ This is confirmed in the presence of significant bacteriuria based on isolation of $\geq 10^5$ cfu/ml of same species of bacteria in properly collected and transported midstream urine during a screening test.³⁻⁸

Several studies have shown the overall prevalence of asymptomatic bacteriuria in pregnancy to be between 2-7%,^{3,5,8-13} but may be as high as 10% in high risk populations.^{9,14,15} It is twice as common in pregnant women with sickle cell trait and three times as common in pregnant women with diabetes mellitus as in normal pregnant women.^{3,9,14,16} Other conditions associated with increased incidence include low socio-economic status, grandmultiparity and advancing age.^{10,17} However, several studies have shown that the prevalence of ASB in developing countries is higher than in the developed countries.

The significance of asymptomatic bacteriuria in pregnancy lies in its potential to cause acute pyelonephritis, preterm labor and preterm rupture of membranes. Others include anemia, pre-eclampsia, chronic pyelonephritis and even fetal wastage.^{5,18-21} It is associated with acute pyelonephritis in 25-30% of pregnant women compared with 1-2% in those without asymptomatic bacteriuria.^{7,8,22,23}

This study assessed the prevalence of ASB among pregnant women attending antenatal care in University of Ilorin Teaching Hospital.

Methods

This was a prospective descriptive study amongst asymptomatic pregnant women attending their first antenatal clinic visit, at the Maternity wing of the University of Ilorin Teaching Hospital, Ilorin between July and October, 2007. Systematic random sampling technique was employed in recruiting 125 subjects who met the stated criteria. A structured proforma containing information on bio-data was administered on all recruited subjects at booking, and physical examination was done by medical personnel on the research team after obtaining informed consent. Subjects were informed of their results and those with positive culture were treated with a course of antibiotics based on the sensitivity pattern and duly followed up in the clinic to ensure bacteriological cure.

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The study was approved by the Ethical Research Committee of the Hospital.

Laboratory Procedure

About 5 ml of midstream urine was collected into a sterile universal bottle and the sample taken to the microbiology laboratory for microscopy and culture within 2 hours of collection.

Urine Microscopy & Culture

A loop full of well-mixed centrifuged urine was examined under wet preparation procedure to detect pyuria, while noting red cells, casts, parasites and fungi, when present. Urine culture was done with 0.001 ml of well mixed urine delivered by a sterile calibrated wire loop and plated on CLED and blood agar plates, which were incubated aerobically at 35-37°C for 24 hours. Repeat culture was ordered for contaminated specimens. Each significant isolate was identified by colonial morphology, gram staining and biochemical reactions according to standard procedure.²⁴ Antibiotic sensitivity testing was done by emulsifying selected isolates in normal saline at a turbidity compared to 0.5 Mac Farland's standard. Using sterile swabs, suspensions were inoculated on Muller-Hinton agar in accordance with modified Kirby-Bauer method and incubated at 35-37°C for 18-24 hrs. Single antibiotic impregnated discs including; gentamicin (10 µg), amoxicillin (25 µg), augmentin (30 µg), nalidixic acid (30 µg), nitrofurantoin (300 µg), erythromycin (5 µg), cotrimoxazole (25 µg), ceftazidime (30 µg) and cefuroxime (30 µg) were tested against gram-positive and gram-negative organisms as appropriate. Interpretation was done by comparing the diameter of zone of inhibition with those of a standard table in three grades of susceptibility which are sensitive, intermediate and resistant.

Control strains of *Staphylococcus aureus* (ATCC 25923) and *Escherichia coli* (ATCC 25922) were run with the gram-positive and gram-negative isolates, respectively. All procedures were done as recommended by the Clinical Laboratory Standard Institute (CLSI).²⁵ Information obtained were recorded on a data collection sheet designed for the study, and fed into the computer using EPI-INFO version 3.3.2 software package for data analysis.

Results

A total of 125 consenting pregnant women who met the inclusion criteria were studied. The socio-demographic characteristics of the women screened are illustrated in Table 1. Their age ranged between 14 and 40 years with a mean age of 28.5± 4.95. The median and modal ages were 28 and 30 years respectively. Most of the women, (94.4%) were married, while 5.6% were single. The table also shows that majority (64.8%) of the women had tertiary education. Also, 3.2% of the women had no formal education, while 4% and 28% had primary and secondary education respectively. Forty-seven

(37.6%) were Christians while 78 (62.4%) were Muslims. The parity of the women ranged between zero and six, with the modal parity of zero. Forty-nine (39.2%) women were nulliparous, while 47.2% belonged to the para 1-2 group. Three (2.4%) women were grandmultiparous. The gestational age of these women ranged between 9 and 24 weeks with a modal gestational age of 17 weeks. Forty-one (33.3%) had a gestational age between 17 and 20 weeks, while 17.9% had gestational age between 9 to 12 weeks.

Table 1: Sociodemographic characteristics of women screened for asymptomatic bacteriuria.

Characteristics	N=125 N(%)	No of women with ASB (N=50)
Age (years)		
11 – 15	1(0.8)	0
16 – 20	4(3.2)	1
21 – 25	28(22.4)	13
26 – 30	55(44.0)	23
31 – 35	24(19.5)	7
36 – 40	13(10.0)	6
Marital Status		
Single	7(5.6)	4
Married	118(94.4)	46
Educational Level		
None	4(3.2)	1
Primary	5(4.0)	0
Secondary	35(28.0)	17
Tertiary	81(64.8)	32
Religion		
Christianity	47(37.6)	24
Islam	78(62.4)	26
Parity		
0	49(39.2)	22
1 – 2	59(47.2)	20
3 – 4	14(11.2)	6
≥5	3(2.4)	2
Gestational Age		
9 -12	22(17.9)	11
13 – 16	24(19.5)	13
17 – 20	42(33.6)	14
21 – 24	37(29.6)	12

Table 2 shows the results of the urine culture of the 125 pregnant women screened. A total of 50 women had asymptomatic bacteriuria on urine culture, giving a prevalence of 40%. Thirty-five (28%) had no growth on culture, while 40 women (32%) had insignificant bacteriuria. Twelve women had mixed growth which was repeated and subsequently were classified into one of the above three groups. None of the women with asymptomatic bacteriuria had any medical illness.

Table 2: Results of urine culture.

Cases	Total number of patients (%)
Significant growth	50 (40%)
No significant growth	40 (32%)
No growth	35 (28%)
Total	125 (100%)

The profile of bacteria isolated from cases of significant bacteriuria is shown in Table 3. *Staphylococcus aureus* constituted the commonest cultured organism, 36 (72%). This was followed by *Proteus spp.* 7 (14%). Other isolates included *Staphylococcus epidermidis* 3 (6%), *Klebsiella spp.* 2 (4%) and *Escherichia coli* 2 (4%).

Table 3: Profile of bacteria isolated from cases of significant bacteriuria.

Bacteria Isolates	Total (%)
<i>Staphylococcus aureus</i>	36 (72%)
<i>Proteus spp.</i>	7 (14%)
<i>Staphylococcus epidermidis</i>	3 (6%)
<i>Klebsiella spp.</i>	2 (4%)
<i>Escherichia coli</i>	2 (4%)
Total	50 (100%)

The sensitivity pattern of organisms cultured from the cases of significant bacteriuria is illustrated in Table 4. *Staphylococcus aureus*, the commonest isolate showed good sensitivity to gentamicin and nitrofurantoin with 75% and 77.8% of the organisms respectively. *Proteus spp.* showed good sensitivity to gentamicin, nalidixic acid, ceftazidime and cefuroxime. Most of the organisms showed good sensitivity to Nitrofurantoin and gentamicin.

Table 4: Sensitivity pattern of organisms cultured from cases of significant bacteriuria.

Organisms	Antibiotics								
	Gentamicin	Amoxicillin	Augmentin	Nalidixic acid	Nitrofurantoin	Erythromycin	Cotrimoxazole	Ceftazidime	Cefuroxime
<i>S. aureus</i>	S- 75% R- 16.7% IS- 8.3%	S- 25% R- 75%	S- 47.2% R- 44.4% IS- 8.3%	---	S- 77.8% R- 22.2%	R- 36.1% S- 63.9%	S- 5.6% R- 88.9% IS- 5.6%	---	S- 58.3% R- 19.5% IS- 22.2%
<i>Proteus spp.</i>	S- 85.7% IS- 14.3%	---	S- 71.4% R- 14.3% IS- 14.3%	S- 100%	---	---	---	S- 100%	S- 71.4% R- 28.6%
<i>S. epidermidis</i>	S- 66.7% R- 33.3%	S- 33.3% R- 66.7%	S- 33.3% R- 66.7%	---	S- 100%	S- 33.3% R- 33.3% IS- 33.3%	R- 100%	S- 33.3% IS- 66.7%	S- 100%
<i>Klebsiella spp.</i>	S- 100%	S- 100%	S- 100%	R- 100%	S- 100%	---	R- 100%	S- 50% IS- 50%	S- 100%
<i>Escherichia coli</i>	S- 50% R- 50%	S- 50% R- 50%	R- 50% IS- 50%	S- 100%	S- 100%	---	S- 50% R- 50%	S- 50% R- 50%	S- 50% R- 50%

- not tested; S- sensitive; R- resistance; IS-intermediate sensitivity.

Discussion

The patients involved in the study though recruited randomly at booking were mainly between 21-30 years of age, this being about the peak reproductive period in this environment and most societies. Most of the women (94.4%) were married and this could be associated with the higher chance of pregnancy being planned and thus presentation for antenatal care compared to singles. The literacy rate was quite high with 64.8% having tertiary education and 28% having secondary education. The women were also mainly of low parity (86.4%). These were both in keeping with other studies which found antenatal booking to be high in women with at least secondary school education and low parity.^{26,27} Of the women recruited, 62.4% were Muslims and 37.6% Christians, Ilorin being a predominantly Muslim community. Fifty-one percent (51%) of the Christians and 33% of the Muslims had positive culture results. The lower prevalence in the Muslims might be attributed to rinsing of the vulva following every episode of urination, practiced in the religion. However Sescon et al. found low socio-economic status, high parity and advancing age to be associated with increased prevalence of asymptomatic bacteriuria in pregnancy.⁴ McNair et al.²⁸ and Akinloye et al.²⁹ found an increased association of asymptomatic bacteriuria with parity.

This study found 50 cases of significant bacteriuria among the 125 pregnant women at UIH giving a prevalence rate of 40%. This is higher than the reported prevalence from Lagos, Ibadan, Sagamu and Ile-Ife of 4%, 12%, 23.9% and 26%, respectively.^{22,30-32} This high prevalence might be due to the fact that only women who booked around the peak gestational age for bacteriuria were recruited for the study. It was however lower than the prevalence of

86.6% reported by Akerele in Benin.³³ These differences may also be attributed to variation in population characteristics such as age, parity, socio-economic status and bacterial ecology.

The strength of the study lies in the fact that measures were taken to ensure that urine samples were appropriately collected and analyzed within two hours of collection. The most common organism isolated was *Staphylococcus aureus* which was isolated from 36 (72%) cases. This was followed by *Proteus spp.* 7 (14%), *Staphylococcus epidermidis* 3 (6%), *Klebsiella* 2 (4%) and *Escherichia coli* 2 (4%). This was consistent with the findings by Akerele in Benin,³³ and Oyagade in Ado-Ekiti,³⁴ who also found *Staphylococcus aureus* as the predominant isolate.

Most of the organisms were very sensitive to nitrofurantoin, gentamicin, cefuroxime and ceftazidime. Resistance to cotrimoxazole and amoxicillin were relatively high. Results showed that 77.8% of *Staphylococcus aureus*, 100% of *Staphylococcus epidermidis*, *Klebsiella* and *Escherichia coli* were sensitive to Nitrofurantoin; while *Staphylococcus aureus* and *Proteus spp.* showed 75% and 85.7% sensitivity respectively to gentamicin. Both antibiotics were also found to be highly effective in studies by Mandara in Zaria,¹² Ezeome in Enugu,³⁵ and Tupin in Ghana.³⁶ Mezue et al.³⁷ at the University of Nigeria found Cotrimoxazole to be virtually useless against pathogens that cause UTI. Amoxicillin and augmentin were only slightly better. A clear alternative as a first line drug against UTI before culture and sensitivity is Nitrofurantoin.^{37,38} Gupta et al. stated that nitrofurantoin is relatively safe in pregnancy and is effective against most urinary tract infections but may cause hemolysis in glucose-6-phosphate dehydrogenase deficient infants if used close to term.³⁶ There is some reluctance among doctors to prescribe nitrofurantoin and this may be due to its side effect profile, but it is clearly an important drug for urinary tract infections.

Conclusion

Overall, the prevalence of asymptomatic bacteriuria in our locality at 40% is high. Therefore, screening for and treatment of asymptomatic bacteriuria in pregnancy should be an integral part of obstetric care and should be included in all antenatal guidelines.

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