Original Article

Asymptomatic Bacteriuria among Antenatal clients in a Secondary Facility in Southwestern Nigeria

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Abstract

Context: Asymptomatic bacteriuria (ASB) is the presence of bacteria in the properly collected urine of a patient that has no signs or symptoms of a urinary tract infection (UTI). If diagnosed early, UTI and its grave consequences can be prevented in pregnant women. **Aims:** The goal was to ascertain the prevalence of ASB in pregnant women attending antenatal clinic. **Subjects and Methods:** The study was a cross-sectional descriptive study. Data were collected using the proforma. Clean catch urine samples were taken and sent for microscopy, culture, and sensitivity. The data were analyzed by statistical package for social sciences (SPSS) version 23. **Results:** A total of 42 women had ASB on urine culture, giving a prevalence of 30.4%. The most common organism cultured was *Escherichia coli* (21[50%]) and most of the organisms isolated were sensitive to nitrofurantoin (88.3%). **Conclusions:** This study found that the prevalence of ASB among antenatal clients was 30.4%. The dominant organism was found to be *E. coli*. Majority of the organisms were sensitive to nitrofurantoin (88.3%), cefuroxime (78.6%), ceftazidime (78.6%), and ceftriaxone (71.4%). We found a positive association between the density/number of urinary pus cells of the participants and the occurrence of ASB.

Keywords: Antenatal, asymptomatic bacteriuria, culture, urine

Introduction

Asymptomatic bacteriuria (ASB) is the presence of bacteria in the properly collected urine of a patient that has no signs or symptoms of a UTI.[1] The presence of bacteria is significant when the urine contains $\geq 10^5$ colony-forming units/ml of a single bacteria.[2]

UTI refers to both microbial colonization of the urine and tissue invasion of any structure of the urinary tract and carries a significant risk of morbidity and mortality to obstetric patient/mother and fetus.[2]

Bacteria found in the urine of patients with ASB usually originate from flora that colonizes the gastrointestinal tract, vagina, and periurethral area.[2] These bacteria then remain in the urinary tract without eliciting a host response sufficient to produce symptoms or cause eradication[3]. *Escherichia coli* is the bacteria found in over 90% of cases, other pathogens are *Klebsiella pneumoniae* and Proteus.[2]

Prompt diagnosis of ASB is essential in reducing morbidity and mortality.[4] The progression to symptomatic bacteriuria could lead to pyelonephritis with its serious complications including miscarriages, preterm contractions, preterm labour, and prematurity and its complications.[4,5]

The American College of Obstetrics and Gynecology advises that a urine culture is done on the first antenatal clinic visit.[6] This will help to identify pregnant women with ASB for the purposes of early intervention.[6] This is, however, not currently a routine booking investigation in many facilities in Nigeria.

Risk factors for UTIs include sickle cell trait or sickle cell disease; diabetes; immunosuppressive disorders; urinary tract obstructions (from stones); loss of bladder control (due to neuromuscular disease); and need for chronic

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instrumentation of the bladder.[4,7] However, many patients without these risk factors still have ASB in pregnancy.[1]

The primary aim of diagnosing and treating ASB in pregnant women is to prevent UTI and their complications.[8] It is agreed that it is worthwhile in populations with a high prevalence of ASB.[8] This study looked to achieve the prevalence of ASB and assess the possible need for including a urine culture as part of the booking antenatal investigations. This would lead to prompt diagnosis and treatment and prevent the untoward complications associated with ASB.

Subjects and Methods

The study was carried out at the Obstetrics and Gynecology Unit of the Our Lady of Apostles Catholic Specialist Hospital, Ibadan, Oyo State.

The study population was consenting pregnant women who presented for booking. It was a cross-sectional study. Participants were appropriately educated about the study during the health talk which is routinely given during the booking clinic. All consenting registered pregnant women fulfilling inclusion criteria were recruited.

Excluded were patients who had symptoms and signs of UTIs or used antibiotics in the preceding two weeks, patients with sickle cell disease, diabetes mellitus, HIV, and patients on immunosuppressive medications.

Sample size determination

The sample size was calculated using the Leslie Kish formula:

$$n = \frac{z^2 pq}{d^2}$$

A prevalence of 9% obtained from a similar study in Kano[9] was used, with an attrition rate of 10% the sample size was 138 clients.

Sampling technique

A systematic sampling method was used. The sampling interval k was calculated

K= (sampling frame/sample size).

*sampling frame = average number of new clients who book for antenatal care yearly.

$K = 2.89$

A sample interval of three was used and every third client was recruited, the first participant was identified using a random number table, and only clients who met the inclusion criteria were recruited.

Instrument of data collection

The instrument of the survey was semi-structured, interviewer-administered proforma used to collect information about biodata, history and examination findings, and laboratory investigations.

Table 1: Sociodemographic characteristics

	n (%)
Age (years)	
20-24	11 (8.0)
25-29	45 (32.6)
30-34	59 (42.8)
35-39	19 (13.8)
Above 39	4 (2.9)
Educational level	
None	9 (6.5)
Primary	18 (13)
Secondary	42 (30.4)
Tertiary	69 (50)
Tribe	
Yoruba	84 (60.9)
Igbo	46 (33.3)
Hausa	7 (5.1)
Others	1 (0.7)
Parity	
Primigravida	22 (15.9)
1	40 (29.0)
2	57 (41.3)
3	15 (10.9)
4 and above	4 (2.9)

Table 2: Antibiotic sensitivity pattern

Drug sensitivity	Number of sensitive organisms, *n* (%)
Ci	30 (71.4)
Cu	33 (78.6)
G	21 (50)
Cf	23 (54.8)
Caz	33 (78.6)
N	35 (88.3)
Amp	17 (40.5)
Aug	27 (64.3)

Ci: Ciprofloxacin, Cu: Cefuroxime, G: Gentamicin, Cf: Ceftriaxone, Caz: Ceftazidime, N: Nitrofurantoin, Amp: Ampicillin, Aug: Augmentin

Procedure for specimen collection and processing

All consenting clients were educated on the procedure for sample collection. They were counselled to wash and dry their hands thoroughly, then open the lid on the sterile container provided and set aside, ensuring not to touch the inside of the lid or the container. They were told to keep their legs apart and hold the skin folds apart while voiding. They were asked to clean the genital area with a sterile towelette provided prior to voiding. They were told to pass a small amount of urine into the toilet, and midway through urination, fill the container to half full. They were to then finish voiding in the toilet, replace the lid of the container and tighten firmly. They were to subsequently wash and dry their hands. The containers were then labelled with the unique code and time of collection noted on the container.

The urine samples were then sent to the microbiology laboratory for microscopy, culture, and sensitivity analysis.

Table 3: Individual organisms antibiotic sensitivity

Organism	Ci (%)	Cu (%)	G (%)	Cf (%)	Caz (%)	N (%)	Amp (%)	Aug (%)
Escherichia coli	s-85.7	s-90.5	s-42.9	s-47.6	s-81.0	s-90.5	s-23.8	s-47.6
Klebsiella pneumoniae	s-66.7	s-88.9	s-42.9	s-47.6	s-77.8	s-88.9	s-77.8	s-88.9
Staphylococcus aureus	s-37.5	s-50.0	s-50.0	s-37.5	s-75.0	s-75.0	s-37.5	s-75.0
Stept. Spp	s-50	s-50	s-50	s-50	s-50	s-0.0	s-50.0	s-100
Proteus	s-100	s-100	s-100	s-100	s-100	s-100	s-100	s-100
Pseudomonas	s-100	s-0.0	s-0.0	s-0.0	s-100	s-100	s-0.0	s-0.0

s: Sensitive, Ci: Ciprofloxacin, Cu: Cefuroxime, G: Gentamicin, Cf: Ceftriaxone, Caz: Ceftazidime, N: Nitrofurantoin, Amp: Ampicillin, Aug: Augmentin

Table 4: Significant bacterial growth according to age, gestational age, parity, packed cell volume, body mass index, and pus cells in urinalysis

	Significant growth, *n* (%)	χ^2, df, *P*
Age		
20-24	7 (16.6)	11.217, 8, 0.190
25-29	10 (23.8)	
30-34	17 (40.5)	
35-39	6 (14.3)	
39 and above	2 (4.8)	
Total	42 (100)	
Gestational age (weeks)		
9-12	5 (11.9)	14.533, 8, 0.069
13-16	11 (26.2)	
17-20	9 (21.4)	
21-24	6 (14.3)	
25 and above	11 (26.2)	
Total	42 (100)	
Parity		
Primigravida	5 (11.9)	5.256, 8, 0.730
1	11 (26.2)	
2	20 (47.6)	
3 and above	6 (14.3)	
Total	42 (100)	
Packed cell volume		
Below 30	7 (53.8)	12.369, 4, 0.013
30-32	20 (40.0)	
33 and above	15 (20.0)	
Total	42 (100)	
Booking BMI		
18-24.9	5 (25)	11.174, 4, 0.025
25-29.9	22 (25.9)	
30 and above	15 (45.8)	
Total	42 (100)	
Pus cells		
1-2	8 (22.2)	117.720, 6, 0.000
3-4	12 (100)	
5 and above	22 (100)	
Total	42 (30.4)	

BMI: Body mass index

Data analysis

The data were analyzed by statistical package for social sciences (SPSS) version 23 (IBM, Armonk, New York, USA). Baseline initial frequency tables and charts were generated for univariate analysis, the association between variables was assessed using the Chi-square test and the level of significance was set at $P < 0.05$.

Ethical considerations

Ethical approval was obtained from the Ethical Review Committee (OCH/EC/17/03). Participants were adequately counseled on the confidentiality of information provided. A written informed consent was obtained.

Results

The prevalence of ASB in this study was found to be 30.4% [Chart 1].

E. coli had the highest sensitivity to cefuroxime and nitrofurantoin (90.5%), and was most resistant to Ampicillin (76.2%). *Klebsiella* spp was most sensitive to cefuroxime, nitrofurantoin, and augmentin (88.9%), with the highest resistance to gentamicin (57.1%). *Staphylococcus Aureus* was most sensitive to ceftazidime, augmentin, and nitrofurantoin (75%), with the highest resistance to ciprofloxacin, ceftriaxone, and ampicillin (62.5%). *Streptococcus* spp was most sensitive to augmentin (100%), with the highest resistance to nitrofurantoin (100%). Proteus showed 100% sensitivity to all the antibiotics. *Pseudomonas* was 100% sensitive to ciprofloxacin, ceftazidime, and nitrofurantoin, with 100% resistance to the other antibiotics tested.

Discussion

Pregnant women are at a higher risk of having UTIs due to the physiologic changes in pregnancy. However, in a majority of these women, the infections are asymptomatic.

The prevalence of ASB in pregnancy among booking antenatal patients in this study was found to be 30.4%, which was comparable to the prevalence of 40% found by Ajayi *et al*. in Ilorin.[10] This was however higher than the rates of 9% in Kano.[9] These differences in prevalence found may be due to variations in the study participants' socioeconomic levels,[11] and cultural and religious behaviors related to personal hygiene and sexual contact.[3,11]

The literacy rate was high with 50% having tertiary education and 30.4% having secondary school education [Table 1]. This is similar to the findings by Ajayi *et al*. in Ilorin,[10] and this

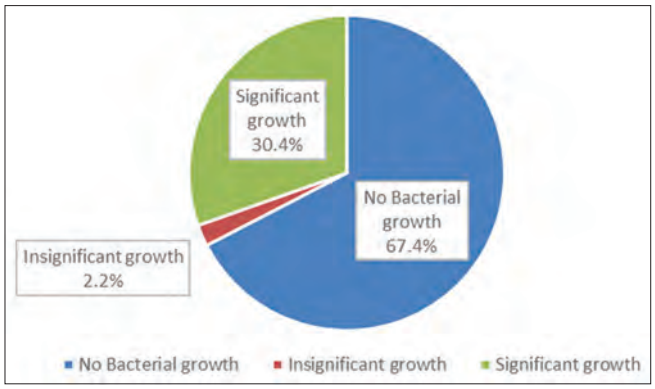

Chart 1: Pie chart – Results of urine culture

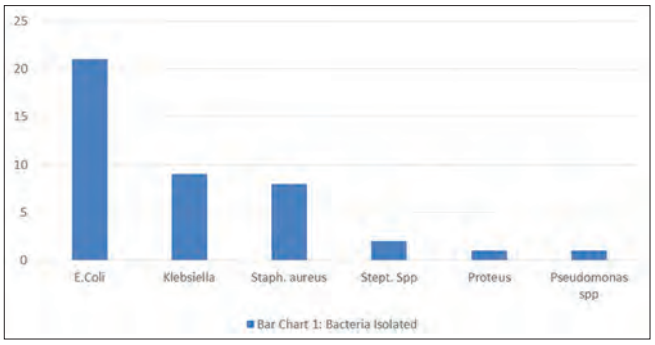

Chart 2: Bar chart – Types of bacteria isolated from midstream urine

could be as a result of a higher tendency for antenatal booking in women with higher education. Most of the women in the study were Yoruba 60.9% followed by Igbo 33.3%, Hausa 5.1%, and other tribes 0.7%, this might be as a result of the study being carried out in the South western part of Nigeria which has a predominance of Yoruba's and Igbos.

The dominant organism found to cause ASB was *E. coli* [Chart 2], this was similar to the findings by Sujatha in India[12] and by Matuszkiewicz-Rowińska *et al*. in Poland,[13] in contrast to findings by Kani *et al.* who found *Staphylococcus saprophyticus* and *Klebsiella* as the dominant organisms,[9] and Ajayi *et al*.[10] who found Staph aureus to be the dominant organism. This may be due to variation in the nature of pathogens between different communities and regions.[11]

Most of the organisms found were sensitive to nitrofurantoin (88.3%), cefuroxime (78.6%), ceftazidime (78.6%), and ceftriaxone (71.4%) [Table 2]. This was similar to results by Ajayi *et al*. in Ilorin.[10] Resistance to ampicillin, gentamicin, ciprofloxacin, and augmentin was quite high with sensitivity levels just 40.5%, 50%, 54.8%, and 64.3%, respectively [Table 3]. The resistance levels to ampicillin, gentamicin, ciprofloxacin, and augmentin may be due to their easy availability and indiscriminate use resulting from over-the-counter sales of these antibiotics for a varying number of conditions.[13] The difference in antibiotic sensitivity pattern could be due to the difference in the organism cultured in the different sites.[13]

There was a positive association between the density/number of urinary pus cells of the participants and the occurrence of ASB. Women with more than 3–4 pus cells tended to have ASB [Table 4]. This is in keeping with the study in Kano.[9] There was also a statistically significant relationship between booking body mass index and ASB in this study [Table 4]. This may be due to the influence of a high body mass index on postvoid residual urine volume.[14] We also found a statistically significant relationship between packed cell volume and ASB [Table 4]. These could be a result of women with anemia being more prone to infections.

This study found there was no statistically significant relationship between sociodemographic factors such as age, gestational age, and parity and the presence of significant bacteriuria [Table 4]. This suggests sociodemographic factors do not have a significant influence on the development of ASB. This was similar to findings by Abdel-Aziz *et al*. who found no statistically significant relationship between sociodemographic factors such as age, gestational age, and parity and the presence of significant bacteriuria. This was also similar to findings by Nteziyaremye *et al*., who found there was no statistically significant relationship between gestational age, parity, and significant bacteriuria.[7] However, they found a statistically significant relationship between age and significant bacteriuria.[7]

Conclusions

This study found that the prevalence of ASB among antenatal clients was 30.4%. The dominant organism was found to be *E. coli*. Majority of the organisms were sensitive to nitrofurantoin (88.3%), cefuroxime (78.6%), ceftazidime (78.6%), and ceftriaxone (71.4%). We found a positive association between the density/number of urinary pus cells of the participants and the occurrence of ASB.

Recommendations

A community-based study should be carried out with a larger sample size so as to further confirm the prevalence and prevailing organisms. This would aid in recommendations on screening and antibiotic prophylaxis.

Limitations

- Women were educated on how to take the midstream urine sample properly but it is uncertain if they kept to instructions since sample collection was not supervised by the researchers
- The study is a hospital-based study and may not be a reflection of actual findings in the community.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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