



Prevalence of Asymptomatic Bacteriuria among Pregnant Women in Kebbi State, Nigeria

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Abstract

Asymptomatic bacteriuria is one of the biggest risk factors for urinary tract infections during pregnancy, yet in most underdeveloped countries, such as Nigeria, there is no guideline that supports routine screening of pregnant women for asymptomatic bacteriuria. As a result, the purpose of this research was to investigate how often asymptomatic bacteriuria is among pregnant women who visit the antenatal clinic at Sir Yahaya Memorial Hospital Birnin Kebbi. After receiving ethical permission from Ministry of Health in Kebbi State, Nigeria and informed consent from all pregnant women involved in the study, a total of 222 midstream urine samples were collected. The urine samples were inoculated on blood agar and CLED agar and then incubated for 24 hours at 37°C. The bacteria that were discovered were identified based on cultural morphology, gram staining properties and a variety of biochemical assays were used to identify them. The disc diffusion method was used to measure antimicrobial susceptibility according to CLSI guidelines. Among the isolates obtained the predominant bacteria associated with asymptomatic bacteriuria were coagulase negative staphylococci followed by *Staphylococcus aureus* with an estimated percentage occurrence of 51.6% and 40.2% respectively. Most of bacteria were isolated among the pregnant women within the age group 20-29 years 84 (68.9%), followed by age range 30-39 years with 28 (23.0%). The current study also revealed that, the cases of asymptomatic bacteriuria occur more predominantly in second trimester and most of the isolates were susceptible ciprofloxacin, azithromycin and trimethoprim sulfamethoxazole. In conclusion, coagulase negative staphylococci was most predominant bacteria isolated and asymptomatic bacteriuria occurred more frequently among age group 20-29, mostly in second trimester. Ciprofloxacin remain a useful antibiotic in the treatment of asymptomatic bacteriuria in this location.

Keywords: Prevalence; Asymptomatic; Bacteriuria; Pregnant women

Introduction

Upper and lower Urinary Tract Infections (UTIs) are distinguished by the anatomic location of the infection: the lower urinary system includes the bladder and urethra, while the upper urinary tract includes the ureters and kidneys [1]. Pregnant women are more likely to develop UTIs than non-pregnant women [2,3]. The female urethra's architecture is particularly important in the etiology of UTIs. In comparison to the male urethra, the female urethra is shorter and is located near the warm, moist peri-rectal region, which is teeming with germs. Bacteria can more easily access the bladder in the female host due to the shorter urethra. The urinary system is second only to the respiratory tract in terms of microbial infection transmission, especially in women [4].

Asymptomatic bacteriuria is frequent, however it varies greatly depending on age, gender, and the existence of genitourinary anomalies or underlying diseases or disorders. Pregnant women should be screened for asymptomatic bacteriuria and treated if necessary (due to the risk of developing a severe symptomatic UTI and causing harm to the fetus). During pregnancy, the physiology of a woman's body undergoes numerous changes, including hormonal and physical changes that cause urine stasis and the rising up of urine from the bladder into the ureters. These alterations, together with a small urethra in females (about 3-4 cm), enhance the risk of UTI in pregnant women [5]. Because of the physiological changes involved with pregnancy, pregnant women's immunity is generally lowered [6]. Furthermore, pregnancy's glycosuria and aminoaciduria provide an ideal environment for bacterial growth. Untreated upper UTI in pregnancy has been linked to increased morbidity and, in rare cases, fatality in pregnant women [7].

Other risk factors include sickle cell trait or disease, diabetes, immunosuppressive disorders, urinary tract blockages (due to stones), loss of bladder control (due to neuromuscular disease), and the requirement for long-term bladder instrumentation [8]. Pregnancy accelerates the progression of bacteriuria from asymptomatic to symptomatic, which can lead to pyelonephritis. Pyelonephritis, in turn, can lead to complications such as preterm labor, which is the most common cause of serious complications, including low birth weight, higher fetal mortality rates, and prematurity [9,10]. Asymptomatic bacteriuria was previously found to affect 2 to 13 percent of pregnant women, while symptomatic UTI affects 1-18 percent of women during pregnancy [11]. During pregnancy, UTI can cause complications such as pyelonephritis, hypertensive illness of pregnancy, anemia, chronic renal failure, early delivery, and foetal mortality. At the first prenatal appointment, a routine quantitative urine culture should be conducted [12]. *Escherichia coli*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Proteus* species, *Enterococcus faecalis*, and *Enterobacter* species are the most common pathogens recovered from UTI patients. The extent to which one or two of these organisms predominate over others is determined by the environment [13].

Undiagnosed and untreated bacteriuria in pregnancy is linked to a number of risk factors. In about 5% of pregnant women, this resulted in acute pyelonephritis, which raised the risk of low birth weight and perinatal death [14]. As a result, it has been reported that detecting and treating bacteriuria can avoid up to 80% of pyelonephritis occurrences [15]. The majority of bacteriuria cases in pregnancy are caused by past colonization during sexual activity rather than acquisition during the pregnancy [16]. Although most cases of asymptomatic bacteriuria may

not require treatment since the bacteria are not causing disease, pregnant women and their unborn children may face problems [17]. Furthermore, there is definitely a significant risk that the infecting bacteria will develop resistance to commonly prescribed antimicrobial drugs in the community. Given the scarcity of information on the prevalence of asymptomatic bacteriuria among pregnant women in Kebbi State, Nigeria. The goal of this study was to find out how common asymptomatic bacteriuria is in pregnant women, as well as the antimicrobial sensitivity pattern of bacterial isolates to regularly used antibiotics in the state.

Materials and Methods

Study area: The study was carried out at Sir Yahaya Memorial Hospital in Birnin Kebbi, Kebbi State. The state is bound with Sokoto State to the north and east, Niger State to the south, and Benin Republic to the west. Kebbi State, which is located between latitude 10°8'N and 13° 15'N and longitude 3° 30'E and 6° 02'E. It covers 36,129 square kilometers of land. Agriculture is the primary source of income for most people, particularly in rural areas. The majority of the crops produced are grains. Fishing and animal husbandry are also popular. According to the 1991 census, the state's total population is 3,137,989 people. Hausa people make up the majority of the population in Kebbi.

Study population: During the study period, all pregnant women who visited Sir Yahaya Memorial Hospital for antenatal care were recruited in the study population.

Design of the research: This was a hospital-based cross-sectional study.

Criteria for inclusion: All agreed pregnant women without symptoms of UTI who visited Sir Yahaya Memorial Hospital in Birnin Kebbi for antenatal care were included in this study.

Criteria for exclusion: This study excluded all pregnant women with signs of urinary tract infection, those who refused to give their consent, and those who had taken antibiotics for at least two weeks for any reason before sample collection.

Ethical approval: The Kebbi State Ministry of Health was contacted for ethical permission and the approval was granted. All participants gave their informed consent, both in writing and orally.

Collection of samples: After receiving consent from the Kebbi State Ministry of Health, midstream urine samples were collected aseptically from 222 pregnant women at Sir Yahaya Memorial Hospital. All pregnant women were taught how to collect midstream

urine samples aseptically, which meant cleaning the vulva and then the outer labia, and finally the inner labia (clean from front to back). While the specimen was being passed, the labia were separated. The first part of the urine sample was discarded, while the middle portion was poured into a sterile, leak-proof, wide-mouthed container with a tight-fitting cover.

Culture of Urine: A loopful (0.01 ml) of urine sample was inoculated on blood agar and Cysteine Lactose Electrolyte Deficient agar (CLED) using a calibrated wire loop, and then incubated aerobically at 37°C for 24 hours.

Identification of the isolated bacteria: The bacterial isolates were identified using colony morphology (color, size, and pattern), gram staining characteristics, and a series of biochemical tests, including the citrate, urease, indole, catalase, coagulase tests, imvic test, and growth on mannitol salt agar and EMB agar [18].

Identifying significant bacteriuria: A bacterial count greater than 1×10^5 /ml was considered substantial bacteriuria, whereas a bacterial count less than 1×10^5 /ml were considered inconsequential bacteriuria.

Antimicrobial Susceptibility Test (AST): The disc diffusion method provided in this study was a variation of the Kirby Bauer technique, which has been extensively standardized by CLSI. Antimicrobial susceptibility tests were obtained using disc diffusion method. The inoculums were adjusted to turbidity comparable to a 0.5 McFarland standard after the colonies were suspended in saline. In the modified suspension, a sterile cotton swab was dipped. The swab was then rotated several times before being forcefully placed against the tubes inside wall above the fluid level. The surplus inoculum was then extracted from the swab. Swabbing the swab over the entire sterile dry surface of a Mueller-Hinton agar plate. Antimicrobial discs were placed onto the surface of the inoculated agar plate. To establish complete contact with the agar surface, each disc was pressed down. The discs were equally dispersed, with no discs closer than 24 mm from center to center. After the discs were applied, the plates were inverted and placed in an incubator set at 36°C for 18 hours. The diameters of the zones of perfect inhibition (as evaluated by the naked eye), as well as the disc's diameter, were measured. Using a ruler held on the back of the inverted Petri-plate, zones were measured to the closest whole mm. To the agents examined, the organisms were classified as sensitive, intermediate, or resistant.

Results

Results show in Tables 1-4.

S/N	Bacterial isolates	Number of Occurrence	Percentage Occurrence
1	CoNS	63	51.6
2	<i>Staphylococcus aureus</i>	49	40.2
3	<i>Escherichia coli</i>	7	5.7
4	<i>Klebsiella pneumoniae</i>	3	2.5
	TOTAL	122	100

CoNS: Coagulase Negative staphylococci

Table 1: Distribution of bacteria associated with asymptomatic bacteriuria among pregnant women in Kebbi State.

S/N	Age range	No. of Samples (%)	Number of Positive Samples (ASB)(%)
1	15–19	18 (8.2%)	7 (5.7%)
2	20–29	142 (64.5%)	84 (68.9%)
3	30–39	54 (30%)	28 (23.0%)
4	40–49	6 (24.5%)	3 (2.5%)
	TOTAL	220 (100)	122 (100)

Table 2: Incidence of asymptomatic bacteriuria among pregnant women in relation to age in Kebbi State.

S/N	Trimester (Gestation period)	No. of Samples (%)	Number of Positive Sample (ASB)(%)
1	1St trimester	8 (3.6%)	2 (1.6%)
2	2nd trimester	134 (60.9%)	82 (67.2%)
3	3rd trimester	78 (35.5%)	38 (31.1%)
	TOTAL	220(100)	122(100)

Table 3: Incidence of asymptomatic bacteriuria among pregnant women in relation to gestation period.

S/N	Organism	No. of isolates	Pattern	PRL	CIP	SXT	CFM	CRO	AZM
	Coagulase Negative <i>Staphylococci</i> (CONS)		S	4 (12.1%)	16 (48.5%)	10 (30.3%)	0 (0%)	0 (0%)	7 (21.2%)
1		33	I	14 (42.4%)	6 (18.2%)	1 (3.0%)	0 (0%)	2 (6.1%)	8 (24.2%)
			R	15 (45.5%)	11 (33.3%)	22 (66.7%)	33 (100%)	31 (94.0%)	18 (54.5%)
			S	4 (18.2%)	16 (72.7%)	5 (22.7%)	0 (0%)	3 (13.6%)	14 (63.6%)
2	<i>Staphylococcus aureus</i>	22	I	6 (27.3%)	2 (9.1%)	1 (4.5%)	0 (0%)	0 (0%)	4 (18.2%)
			R	12 (54.5%)	4 (18.2%)	16 (72.7%)	22 (100%)	19 (86.4%)	4 (18.2%)
			S	1 (33.3%)	2 (66.7%)	1 (33.3%)	0 (0%)	1 (33.3%)	1 (33.3%)
3	<i>Escherichia coli</i>	3	I	1 (33.3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
			R	1 (33.3%)	1 (33.3%)	2 (66.7%)	3 (100%)	2 (66.7%)	2 (67.7%)
			S	1 (33.3%)	1 (33.3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
4	<i>Klebsiella pneumoniae</i>	3	I	1 (33.3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
			R	1 (33.3%)	2 (66.7%)	3 (100%)	3 (100%)	3(100%)	3(100%)

PRL-Piperacillin, CIP-Ciprofloxacin, SXT-Trimethoprim sulfamethaxazole, CFM- Cefuroxime, CRO-ceftriaxone, AZM- Azithromycin.

Table 4: Antimicrobial susceptibility pattern of some isolated bacteria to commonly used antibiotics in Kebbi State.

S/N	Organism	No. of Isolates	Pattern	E	CAZ	CXM	AML	VA	CTX
	Coagulase Negative <i>Staphylococci</i> (CONS)		S	6 (18.2%)	12 (36.3%)	0(0%)0	1(3.0%)	1(3.0%)	11 (33.3%)
1		33	I	7 (21.2%)	0 (0%)	0 (0%) 0	4 (12.2%)	11 (33.3%)	3 (9.1%)
			R	20 (60.6%)	21 (63.7%)	33 (100%)	28 (84.8%)	21 (63.6%)	19 (57.6%)
			S	9 (40.9%)	1 (4.5%)	1 (4.5%)	7 (31.8%)	3 (13.6%)	1 (4.5%)
2	<i>Staphylococcus aureus</i>	22	I	3 (13.6%)	1 (4.5%)	1 (4.5%)	0(0%)	2 (9.1%)	0 (0%)
			R	10 (45.5%)	20 (90.9%)	20 (90.9%)	15 (68.2%)	17 (77.3%)	21 (95.5%)
			S	0 (0%)	0(0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
3	<i>Escherichia coli</i>	3	I	0 (0%)	0(0%)	0 (0%)	0 (0%)	1 (33.3%)	0(0%)
			R	3 (100%)	3 (100%)	3 (100%)	3 (100%)	2 (66.7%)	3 (100%)
			S	0 (0%)	0 (0%)	0(0%)	0 (0%)	1 (33.3%)	0 (0%)
4	<i>Klebsiella pneumoniae</i>	3	I	1 (33.3%)	0 (0%)	0(0%)	0 (0%)	1 (33.3%)	0 (0%)
			R	2 (66.7%)	3 (100%)	3(100%)	3 (100%)	1 (33.3%)	3 (100%)

E-Erythromycin, CAZ-Caftazidine, CXM-Cefoxitime, AMX-Amoxicillin, VA-Vancomycin, CTX-Cefotaxime.

Discussion

This study found that the overall prevalence of asymptomatic bacteriuria was 55.5 percent, which is greater than prior findings. The most common bacteria isolated from the pregnant women's mid-stream urine samples were Coagulase Negative Staphylococci (CONS), which made up 51.6 percent of the total, followed by *Staphylococcus aureus*, which made up 40.2 percent. Other bacteria isolated included *Escherichia coli* (5.7 percent) and *Klebsiella pneumoniae*, which made up the remaining 2.5 percent. This study's

findings on the spread of bacteria linked with asymptomatic bacteriuria match those of and those in Ibadan, Nigeria [19,20]. The findings are consistent with those of, who found coagulase negative staphylococci to be the most common gram positive bacteria recovered in Lucknow, India, followed by *Staphylococcus aureus*.

Most bacteria were found in pregnant women aged 20-29 years (68.9%), followed by 30-39 years (54%) and 15-19 years (6.25%). The lowest rates were found in the age groups 15-19 and 40-49 years, with percentage occurrences of 18 (8.2%) and 6 (24.5%), respectively.

These findings were comparable to those of in eastern Ethiopia, who found that the age range 18-34 had the largest amount of bacteria [21,22]. Who found a significant prevalence of asymptomatic bacteriuria in pregnant women aged 35 to 39 years, disagree with the findings of this study. The highest rate of asymptomatic bacteriuria were seen among women aged 20 to 29, which could be attributable to the fact that most women in this age range are sexually active and thus have a higher chance of developing a urinary tract infection [23-25].

The current study also discovered that asymptomatic bacteriuria occurs more frequently in the second trimester, with an estimated percentage occurrence of 82 (67.2%), followed by the third trimester, with 78 (35.5%), and the least occurred on first trimester, with an estimated percentage incidence of 8 percent (3.6 percent). This finding is consistent with the findings in Yemen; in Ethiopia and in Ibadan, Nigeria (2006). However, this discovery contradicted Turpin findings, which showed a significant percentage of asymptomatic bacteriuria in the first trimester of pregnancy. The high frequency in the second trimester could be attributed to the uterus's expansion in the second and third trimesters, as well as the increasing smooth muscle relaxing effect of pregnancy hormones on the bladder's pressure from descending, which could lead to static urine, which would encourage bacterial multiplication.

The antimicrobial susceptibility pattern of CONS revealed that the bacteria were sensitive to ciprofloxacin 16 (48.5%), trimethoprim sulfamethoxazole (30.3%), and azithromycin (21.2 percent). Cefuroxime, ceftriaxone, and piperacillin all showed high resistance. Ciprofloxacin and azithromycin were more sensitive to *Staphylococcus aureus* (63.6%) while Cefuroxime, ceftriaxone, piperacillin, and trimethoprim sulfamethoxazole all showed high resistance. The susceptibility pattern of *E coli* and *Klebsiella pneumoniae* found in this investigation demonstrated that the bacteria were responsive to ciprofloxacin but resistant to nearly all drugs tested. This finding contradicts as well as, who conducted a study in Luknow, India (2021). The discrepancies in susceptibility patterns could be attributable to variances in geographical location and antibiotic usage in different parts of the world [26].

Conclusion

Coagulase negative *staphylococci* are the most predominant bacteria associated with significant bacteriuria among pregnancy in this centre followed by *Staphylococcus aureus* with an estimated percentage occurrence of 51.6% and 40.2% respectively. Most of bacteria were isolated among the pregnant women within the age group 20-29 years (68.9%), followed by age range 30-39 years with 54 (30%), the lowest rate was recorded in age group 15-19 and 40-49 years with the percentage occurrence of 18 (8.2%) and 6 (24.5%) respectively. The current study also revealed that, the cases of asymptomatic bacteriuria occur more predominantly in second trimester with an estimated percentage occurrence of 82 (67.2%), this is followed by third trimester 78 (35.5%) while the least occurred in first trimester with an estimated percentage occurrence of 8 (3.6%). Most of the isolates were susceptible ciprofloxacin, azithromycin and trimethoprim sulfamethoxazole. It is recommended that, screening of all pregnant women as well as antimicrobial susceptibility pattern should be routinely carried out in second and third trimester in order to prevent complication due to infection.

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