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Research Article

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

Kalgo, ZM[1*], Yusuf AB[2], Umar S[3], Mohammed, BD[4], Aliyu B[5], Gulumbe BH[6]

[1]*Lecturer I, Department of Microbiology, Faculty of Science, Federal University Birnin Kebbi, Kebbi State, Nigeria*

[2]*Professor, Department of Microbiology, Faculty of Science, Federal University Birnin Kebbi, Kebbi State, Nigeria*

[3]*Senior Lecturer, Department of Microbiology, Faculty of Science, Federal University Birnin Kebbi, Kebbi State, Nigeria*

[4]*Associate Professor, Department of Microbiology, Faculty of Science, Federal University Birnin Kebbi, Kebbi State, Nigeria*

[5]*Lecturer I, Department of Microbiology, Faculty of Science, Federal University Birnin Kebbi, Kebbi State, Nigeria*

[6]*Lecturer II, Department of Microbiology, Faculty of Science, Federal University Birnin Kebbi, Kebbi State, Nigeria*

[*]Corresponding author

Kalgo, ZM, Lecturer I, Department of Microbiology, Faculty of Science, Federal University Birnin Kebbi, Kebbi State, Nigeria

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Abstract

One of the major risk factors that resulted in urinary tract infections during pregnancy is asymptomatic bacteriuria but however, in most developing countries like Nigeria, there is no guideline which recommends routine screening of pregnant women for asymptomatic bacteriuria. Thus, this study was designed with the aim to determine the prevalence of asymptomatic bacteriuria in pregnant women attending antenatal clinic at Sir Yahaya Memorial Hospital Birnin Kebbi. A total of 222 midstream urine samples were collected after obtaining the ethical approval from ministry of health Kebbi State, Nigeria and also the informed consent from all the pregnant women used for this study. The urine samples were inoculated on blood agar, and CLED agar which was then incubated at 37oC for 24 hours. The bacteria isolated were identified based on colonial morphology, gram staining characteristics and series of biochemical tests. Antimicrobial susceptibility test was determined using disc diffusion method 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 (68.9%), followed by age range 30-39 years with 54(30%). 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 were 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

Urinary tract infections (UTIs) are characterized as being either upper or lower based primarily on the anatomic location of the infection: the lower urinary tract encompasses the bladder and urethra, and the upper urinary tract encompasses the ureters and kidneys [1]. UTI are more common in pregnant than non-pregnant women [2,3]. The anatomy of the female urethra is of particular importance to the pathogenesis of UTIs. The female urethra is relatively short compared with the male urethra and also lies in close proximity to the warm, moist, perirectal region, which is teeming with microorganisms. Because of the shorter urethra, bacteria can reach the bladder more easily in the female host. The urinary

tract is second only to the respiratory tract in acquiring microbial infections, especially in females [4]. Asymptomatic bacteriuria is common but its prevalence varies widely with age, gender, and the presence of genitourinary abnormalities or underlying diseases or conditions. Thus, screening and treatment for asymptomatic bacteriuria was recommended for pregnant women (because the risk of progression to severe symptomatic UTI and possible harm to the fetus) [1]. A lot of changes occur in physiology of a woman's body during pregnancy, this comprised of hormonal and physical changes that increase urine stasis and the climbing up of urine from the bladder into the ureters. These changes, in combination of short urethra (approximately 3 - 4 cm in females) increase the occurrence of UTI in pregnant women [5]. In general, the pregnant women have suppressed immunity because of the physiological changes associated with pregnancy [6]. Furthermore, the glycosuria and aminoaciduria of pregnancy provide an excellent medium for bacterial proliferation. Untreated upper UTI in pregnancy carries documented risk of morbidity, and rarely, mortality to the pregnant women [7].

Other risk factors identified 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 instrumentation of the bladder [8]. Pregnancy increase the progression from asymptomatic to symptomatic bacteriuria which could eventually lead to pyelonephritis and Pyelonephritis, in turn, can result to adverse outcomes such as preterm labour, which is the most common cause of serious complications-including low-birth weight, higher fetal mortality rates and prematurity [9,10]. The earlier reported prevalence of asymptomatic bacteriuria was 2 to 13% in pregnant women while symptomatic UTI occurs in 1–18% during pregnancy [11]. Complications such as pyelonephritis, hypertensive disease of pregnancy, anaemia, chronic renal failure, premature delivery and foetal mortality are cause by UTI during pregnancy. Standard quantitative urine culture should be performed routinely at first antenatal visit [12]. The prevalent organisms that are usually isolated from UTIs patients are Escherichia coli, Staphylococcus aureus, Klebsiella pneumoniae, Pseudomonas aeruginosa, Proteus species, Enterococcus faecalis and Enterobacter species. The prevalence and degree of occurrence of one or two of these organisms over others are dependent on the environment [13].

Considerable risk factor is associated with undiagnosed and untreated bacteriuria in pregnancy. This led to acute pyelonephritis in approximately 5% of pregnant women with increased risk of low birth weight and prenatal fatal death [14]. Therefore, detection and treatment of bacteriuria has been reported to prevent up to 80% cases of pyelonephritis [15]. Most of the cases of bacteriuria in pregnancy usually occurs as a result of prior colonization during sexual activity rather than acquisition during pregnancy itself [16]. Most cases of asymptomatic bacteriuria may not require treatment because the bacteria may not be causing disease, but pregnant women and their unborn foetuses may be at risk of complications [17]. Furthermore, there is obviously a substantial risk that the infecting pathogens are becoming resistant to empirically prescribed antimicrobial agents normally used in the community. Considering the paucity of data on the Prevalence of Asymptomatic Bacteriuria Among Pregnant Women in Kebbi State, Nigeria. This study was designed to investigate the prevalence of asymptomatic bacteriuria in pregnant women and the antimicrobial susceptibility pattern of the bacterial isolates to commonly used antibiotics in the state.

Material and Methods

Study Area

The study was carried out in Sir Yahaya Memorial hospital Birnin Kebbi, kebbi State. Kebbi State is located between latitude 10o8'N and 13 o 15'N and longitude 3 o 30'E and 6 o 02'E, the state is bounded by Sokoto State to the north and east, Niger State to the south, and Benin Republic to the west. It has a total land area of 36,129 sq. km. Agriculture is the main occupation of the people especially in rural areas. Crops produced are mainly grains. Animal rearing and fishing are also common. The state has the total population of 3,137,989 people as projected from the 1991 census. Kebbi state is mainly populated by Hausa people.

Study Population

The study population included all the pregnant women attending Sir Yahaya Memorial Hospital for antenatal care during the period of study.

Study design

This was a Cross-sectional and hospital-based study.

Inclusion criteria

This study included all consented pregnant women attending Sir Yahaya Memorial hospital Birnin Kebbi without symptom of UTI.

Exclusion criteria

This study excluded all pregnant women with apparent symptoms of urinary tract infection, those who do not give their consent and those who took antibiotics at least two weeks for any cause prior to sample collection were excluded from the study.

Ethical approval

Ethical approval was sought for from the Kebbi State Ministry of Health. Informed consents both written and oral were obtained from all participants.

Sample Collection

Midstream urine specimens were collected aseptically from 222 pregnant women attending Sir Yahaya Memorial Hospital after obtaining an approval from the Kebbi State Ministry of Health. All pregnant women were instructed on how to collect the midstream urine samples aseptically, i.e. they were asked to Clean the vulva; first the outer labia; then the inner (clean from front to back). The labia were separated while the specimen was passed. The initial

part of the urine sample was discarded while the middle portion of the urine were passed into a well-labeled sterile, leak proof, wide mouthed container, with tight fitting cover [9].

Urine Culture

Using a calibrated wire loop, a loopful (0.01 ml) of urine sample were inoculated on blood agar and cysteine lactose electrolyte - deficient agar (CLED) and then was incubated aerobically at 37°C for 24hours.

Identification of bacteria isolates

The bacterial isolates were identified on the basis of their colony morphology (color, growth size and growth pattern), Gram staining characteristics and series of biochemical tests which included Citrate, Urease, Indole, Catalase, Coagulase tests, imvic test, growth on mannitol salt agar and EMB agar as described by Cheesbrough [18].

Determination of Significant Bcteriuria

The Significant bacteriuria were determined by a bacterial count greater than 1 x 105/ml, while a bacterial count less than 1 x 105/ml were regarded insignificant bacteriuria

Antimicrobial Susceptibility Test (AST)

Antimicrobial susceptibility test was determined using disc diffusion method, the disc diffusion method that was presented in this study, was a modification of the Kirby Bauer technique that has been carefully standardized by CLSI. The colonies were suspended in saline, and then the inoculums were adjusted to a turbidity equivalent to a 0.5 McFarland standard. A sterile cotton swab was dipped into the adjusted suspension. The swab was then rotated several times and pressed firmly on the inside wall of the tube above the fluid level. This removed the excess inoculum from the swab. The dried surface of a Mueller-Hinton agar plate was inoculated by swabbing the swab over the entire sterile agar surface. The predetermined batteries of antimicrobial discs were dispensed onto the surface of the inoculated agar plate. Each disc was pressed down to ensure complete contact with the agar surface. The discs were distributed evenly so that they are no closer than 24 mm from center to center. The plates were inverted and placed in an incubator set to 36°C within 15 minutes after the discs were applied and incubated for 18 hours. The diameters of the zones of complete inhibition (as judged by the unaided eye) were measured, including the diameter of the disc. Zones were measured to the nearest whole millimetre, using a ruler, which was held on the back of the inverted Petri-plate. The organisms were reported as susceptible, intermediate or resistant to the agents that were tested.

Results

Table 1: Distribution of bacteria associated with Asymptomatic Bacteriuria among pregnant women in Kebbi State

S/N	Bacterial isolates	Number of Occurrence	Percentage Occurrence
1	CoNS	63	51.6
2	*Staphylococcus aureus*	49	40.2
3	*Escherichia coli*	7	5.7
4	*Klebsiella pneumoniae*	3	2.5
	TOTAL	122	100
CoNS: Coagulase negative staphylococci			

Table 2: Incidence of Asymptomatic Bacteriuria among pregnant women in relation to age 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 3: Incidence of Asymptomatic Bacteriuria among pregnant women in relation to gestation period

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

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

Table 5: Antimicrobial susceptibility pattern of some isolated bacteria to commonly used antibiotics in Kebbi State

S/N	Organism	No. of isolates	Pattern	PRL	CIP	SXT	CFM	CRO	AZM
1	*Coagulase Negative Staphylococci (CONS)*	33	S I R	6(18.2%) 7(21.2%) 20(60.6%)	12(36.3%) 0(0%) 21(63.7%)	0(0%)0 0(0%)0 33(100%)	1(3.0%) 4(12.2%) 28(84.8%)	1(3.0%) 11(33.3%) 21(63.6%)	11(33.3%) 3(9.1%) 19(57.6%)
2	*Staphylococcus aureus*	22	S I R	9(40.9%) 3(13.6%) 10(45.5%)	1(4.5%) 1(4.5%) 20(90.9%)	1(4.5%) 1(4.5%) 20(90.9%)	7(31.8%) 0(0%) 15(68.2%)	3(13.6%) 2(9.1%) 17(77.3%)	1(4.5%) 0(0%) 21(95.5%)
3	*Escherichia coli*	3	S I R	0(0%) 0(0%) 3(100%)	0(0%) 0(0%) 3(100%)	0(0%) 0(0%) 3(100%)	0(0%) 0(0%) 3(100%)	0(0%) 1(33.3%) 2(66.7%)	0(0%) 0(0%) 3(100%)
4	*Klebsiella pneumonaie*	3	S I R	0(0%) 1(33.3%) 2(66.7%)	0(0%) 0(0%) 3(100%)	0(0%) 0(0%) 3(100%)	0(0%) 0(0%) 3(100%)	1(33.3%) 1(33.3%) 1(33.3%)	0(0%) 0(0%) 3(100%)
E- Erythromycin, CAZ-Caftazidine, CXM-Cefoxitime, AMX-Amoxicillin, VA-Vancomycin, CTX-Cefotaxime									

Discussion

The overall prevalence of asymptomatic bacteriuria as reported from this was 55.5%, this finding is higher than those previously reported. The most common bacteria isolated from the mid-stream urine samples of the pregnant women were coagulase negative staphylococci (CONS) with an estimated percentage occurrence of 51.6%, followed by Staphylococcus aureus (40.2%), other bacteria isolated include Escherichia coli (5.7%) and Klebsiella pneumoniae (2.5%). The distribution of the bacteria associated with asymptomatic bacteriuria as recorded in this study tally with the findings of Igwegbe et al., and the findings in Ibadan, Nigeria [19]. The result also tallies with work of Sonkar et al., in Lucknow India where they documented coagulanase negative staphylococci as the most predominant gram-positive bacteria isolated followed by Staphylococcus aureus [20].

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 finding from this study was similar to the work of Edae et al., in eastern Ethiopia where they isolated

the highest number of bacteria within the age group 18-34 [21]. The report from this study contradict the work of Turpin et al., and Amadi et al., who documented high prevalence of asymptomatic bacteriuria in pregnant women aged 35 to 39 years [22]. Highest Incidence of asymptomatic bacteriuria in the age group 20-29 as reported in this study may be due to the fact that, most of the women in this age group are sexually active, and therefore and have higher risk of contracting urinary tract infection [23-25].

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%). This finding agrees with the work of Alghalibi et al., in Yemen, Edae et al., [21] in Ethiopia and a study in Ibadan, Nigeria by Akinloye et al., [26]. This finding however, did not support the work of Turpin et al., who demonstrated high percentage of asymptomatic bacteriuria in the first trimester of pregnancy [22]. The high frequency in the second trimester may be attributed to the expansion of the uterus in the second and third trimester and also the increasing smooth muscle relaxing effect of pregnancy hormones on the pressure of the bladder from descending, this may lead to static of urine, which in turn encouraged bacterial multiplication by Lawani et al.,

The antimicrobial susceptibility pattern of CONS revealed that, the bacteria were sensitive to ciprofloxacin 16 (48.5%) slightly followed by trimethoprime sulfamethoxazole 10 (30.3%) and Azithromycin 27 (21.2%). High resistance was recorded on cefuroxime, ceftriaxone and piperacillin. Staphylococcus aureus were more sensitive ciprofloxacine 16 (72.7%) and Azithromycin 14 (63.6%). While high resistance was recorded on cefuroxime, ceftriaxone, piperacillin and trimethoprime sulfamethoxazole. The susceptibility pattern of E. coli and Klebsiella pneumoniae as recorded in this study revealed that, the bacteria were susceptible to ciprofloxacin while resistance were recorded in almost all the antibiotics tested. These findings are in contrast with the work of Mekuria et al., and also disagree with study in Luknow India by Sonkar et al., [20]. The differences in the susceptibility pattern may be attributed to the difference in geographical location and local usage of antibiotics.

Conclusion

Coagulase negative staphylococci is 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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