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Research Article

Prevalence of *Staphylococcus aureus* and *Enterococcus* sp. Among Pregnant Women Attending General Hospitals in Delta Central Senatorial District, Nigeria

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Abstract



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This study aimed to assess the prevalence of *Staphylococcus aureus* and *Enterococcus* sp. among pregnant women who visit the General Hospital in Delta Central Senatorial District, Nigeria. Samples were collected from the vaginal and rectum areas of pregnant women attending the General Hospitals of Abraka, Oghara, Udu, Ughelli North and Ughelli South. Bacteriological and biochemical analyses were conducted to isolate, characterize, and identify the bacteria. Two types of bacteria were found; *Enterococcus* sp. and *Staphylococcus* sp. The study result showed that *Staphylococcus aureus* (13.7%) was more prevalent than other isolates and was found in samples obtained from Udu General Hospital. In comparison, Ughelli South General Hospital had the lowest prevalence for *S. aureus* (7.9%). Samples from Oghara General Hospital had the highest prevalence for *Enterococcus* sp. (3.7%) while the lowest prevalence for *Enterococcus* sp. (1.1%) was obtained from Ughelli South General Hospital. *S. aureus* (51.6%) was found to be the most prevalent bacterium, while *Enterococcus* sp. (11.1%) was the least prevalent. The bacterial load from the vaginal swab samples was higher than that of rectum swab samples, which suggests that pregnant women attending these hospitals may have infections. The total bacterial count among pregnant women was highest in samples obtained from Udu General Hospital (5.4±0.5), followed by Abraka (5.0±0.6), Oghara (4.8±0.2), and Ughelli North (4.5±0.15), and while the least count was recorded from samples obtained from Ughelli South General Hospital (3.0±0.2). This study helps manage and plan future medical treatments. Pregnant women should be screened early in their pregnancies, between the 12th and 16th weeks, which is the second trimester, and treated appropriately to avoid complications that arise from untreated infections.

Keywords: Prevalence, vaginal, pregnancy, women, infection

INTRODUCTION

Although prenatal care has advanced and public awareness has increased, adverse pregnancy outcomes remain a significant public health concern globally. The vagina of humans is home to a diverse microbiota that has a protective function in maintaining good health. However, if this microbiota is disrupted, it can hurt the reproductive health of women, particularly during pregnancy. ¹ During pregnancy, women are more likely to develop Urinary tract infections (UTIs) due to hormonal changes and a shift in the position of the urinary tract. This can make it easier for bacteria to reach the kidneys, leading to symptomatic and asymptomatic bacteriuria (bacteria in the urine). Asymptomatic bacteriuria can be particularly dangerous, as up to 45% of untreated cases can lead to pyelonephritis (inflammation of the kidney and pelvis), which can cause complications during pregnancy. If left untreated, a kidney infection can also result in serious conditions like acute respiratory distress syndrome (ARDS) or sepsis, which can be life-threatening.

The prevalence of bacteriuria in women has been reported to range between 3 to 20% in different studies. ² If left untreated, UTIs during pregnancy can increase the risk of multiple maternal and neonatal complications. When gestational UTIs are accompanied by risk factors such as urolithiasis, recurrent

UTI, urinary tract abnormalities, chronic inflammatory diseases, autoimmune disorders, renal parenchymal diseases, and diabetes mellitus, they become more complicated. ³ Hence, it is crucial to treat gestational UTIs promptly. Furthermore, identifying the uro-pathogens in obstetric populations is important to optimize the empiric antibiotic treatments used for treatment. ²

Several studies have been conducted on the microorganisms that are commonly observed in UTIs during pregnancy. Among these microorganisms, *Escherichia coli* is reported to be the most frequent and has been associated with multiple antimicrobial resistance in both clinical and environmental isolates in Nigeria. ^{4,5,6,7,8,9} Other microorganisms, such as *Klebsiella pneumoniae*, *Enterococcus faecalis*, *Staphylococcus epidermidis*, *Streptococcus mitis*, and *Candida albicans* are also frequently found in UTIs. ¹⁰

Over the last decade, *Staphylococcus aureus* has become a leading cause of infections in healthcare settings. *S. aureus* is the most common species of the *Staphylococcus* genus that causes staphylococcal infections in humans. These bacteria can cause community-acquired and nosocomial infections, as well as antibiotic-resistant infections such as methicillin-resistant *S. aureus* (MRSA). It is commonly found colonizing the throat, skin, and gastrointestinal tract of humans. *S. aureus* has many

RESULTS

The biochemical characteristics and cultural morphology of the bacteria isolated from pregnant women in the study region which included: *Staphylococcus aureus* and *Enterococcus* sp. are listed in Table 1. Table 2 displays the total count of bacteria in the pregnant women's sample obtained from the 3rd dilution factor ($\times 10^3$). The highest count was obtained from UDU LGA

(5.4 ± 0.5), followed by Abraka (5.0 ± 0.6), while the lowest count was observed from Ugheli South (3.0 ± 0.2). The prevalence of different bacteria isolated from pregnant women in the study region is shown in Table 3. The prevalence of *Staphylococcus aureus* 98 (51.6%) was higher than *Enterococcus* 21 (11.1%). Figure 2 demonstrates the prevalence of these bacterial isolates.

Table 1: Biochemical Characteristics and Cultural Morphology of the Bacteria Isolates

Shape	Gram stain	Catalase	Oxidase	Citrate	Indole	Urease	Motility	Glucose	Sucrose	Lactose	Acid	Gas	H ₂ S	Organism
Cocci	+	-	-	-	-	-	-	+	+	+	-	-	-	<i>Enterococcus</i> sp.
Cocci	+	+	-	+	-	+	-	+	+	+	+	-	-	<i>Staphylococcus aureus</i>

Key: + = positive, - = negative, v = variable

Table 2. Total Bacteria count of the Sample among pregnant women ($\times 10^3$)

Sampling Site	Bacteria Count
Abraka	5.0 ± 0.6
Oghara	4.8 ± 0.2
Udu	5.4 ± 0.5
Ughelli South	3.0 ± 0.2
Ughelli North	4.5 ± 0.15

Values are expressed as mean \pm Standard deviation

Table 3: Prevalence of bacterial isolates

Isolates	No. of isolates according to source in %					Prevalence (%)
	ABK	OGH	UDU	UGHN	UGHS	
<i>Staphylococcus aureus</i>	10.5	10.5	13.7	8.9	7.9	51.6
<i>Enterococcus</i> sp.	2.6	3.7	2.1	1.6	1.1	11.1
Total	13.1	14.2	15.8	10.5	9	62.7

KEY: ABK=Abraka, OGH =Oghara, UDU = Udu , UGHN= Ughelli North, UGHS= Ughelli South General Hospital

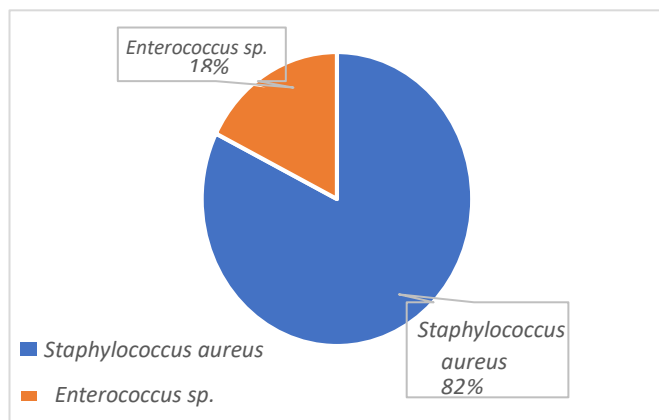


Figure 2: Percentage prevalence of the Bacterial Isolated from Pregnant women

DISCUSSION

Despite the progress in prenatal care and growing awareness among the public, adverse pregnancy outcomes continue to pose a significant public health issue globally. The human vagina is home to a diverse microbiota that plays a protective role in maintaining good health. However, when this microbiota is disrupted, it can have negative consequences on women's reproductive health, particularly during pregnancy.¹² There are various studies related to the most frequently observed microorganisms in UTIs during pregnancy. *Escherichia coli* is reported to be the most critical microorganism which should be kept in mind.¹³ Other bacterial species that have caused colonization in pregnant women reported from other studies include: *Klebsiella pneumoniae*, *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Staphylococcal* species, *Enterococcus sp.* and Group B streptococci.

In this study, however, the prevalence of *Staphylococcus aureus* and *Enterococcus sp.* was determined for pregnant women who attend the General Hospital Abraka, Eku, Udu, and Oghara Teaching Hospital, Delta State, Nigeria. And the bacterial isolates identified were *Enterococcus sp.* and *Staphylococcus aureus* presented in Table 1. These bacteria isolated are in line with that of other similar studies of.^{2, 14, 15.}

Evaluation of the bacteria count of the samples obtained from the pregnant women using the 3rd dilution factor indicated mean \pm SD of 50 ± 2.3 , 48 ± 4.2 , 54 ± 0.5 , 30 ± 1.8 , and 45 ± 0.4 for Abraka, Oghara, Udu, Ughelli South and Ughelli North General Hospitals respectively as presented (Table 2).

From the study, the prevalence of *Staphylococcus aureus* was 10.5%, 10.5%, 13.7%, 8.9%, and 7.9% for General Hospital Abraka, Teaching Hospital Oghara, and General Hospital in Udu, Ughelli North and Ughelli South respectively (Table 3). *S. aureus* had an overall prevalence of 98(51.6%). *Staphylococcus aureus* was the dominant pathogen isolated in this study and this is in agreement with previous studies of.¹⁴ conducted in UBTH in Benin and.¹⁶ which had similar findings. However.¹⁷ reported a lower prevalence of 6.9% in pregnant women and 7.7% in non-pregnant women in their study which they attributed to the higher socioeconomic and educational status of those assessing antenatal services at the UPTH which is a tertiary hospital as well as the stringent measures applied in conducting the laboratory tests.

The rate of vaginal carriage of *S. aureus* has been reported to be 4% – 22% of the vaginal microbiota of pregnant women.¹⁵ The risk factors for *S. aureus* colonization in pregnancy and the association between maternal colonization and infant infections are not very well defined.

Staphylococcus aureus and non-aureus coagulase-negative staphylococci possess a remarkable ability to acquire resistance to multiple antibiotics and the obvious clinical implication of this is limited therapeutic options with attendant increase in mortality and morbidity.¹⁸ The options for chemotherapy are further narrowed in pregnancy when some effective drugs may be contraindicated and this makes the high prevalence of *Staphylococcus aureus* observed in this study all the more worrisome and the need to find solutions more imperative.¹⁹

In addition, the assessment of the prevalence of *Enterococcus sp.* from this study was 5(2.6%),

7(3.75), 4(2.1%), 3(1.6%) and 2(1.1%) for General Hospital Abraka, Teaching Hospital Oghara, General Hospital in Udu, Ughelli North and Ughelli South respectively (Table 4.3). The overall prevalence of *Enterococcus sp.* in the study area was 21(11.1%). This report agrees with that of²⁰ who observed a prevalence of (12.9%) for *Enterococcus faecalis*. Other studies have also reported *Enterococcus sp.* as the most frequent gram-positive organism detected and had been noted as a significant bacterial isolate from women with UTI during pregnancy.²¹

Enterococcus sp. is part of the normal flora of the genital tract however, it can be implicated and cause urinary tract infections and opportunistic infections which result in subacute bacterial endocarditis and abdominal abscesses.²² The predominance of asymptomatic genital tract infection in pregnant women has been reported in several literature, with enterococci causing life-threatening infections in preterm infants and other immunocompromised patients. Maternal Enterococci bacteremia may lead to shock or disseminated intravascular coagulation.²³

The enterococcal species which are considered to be significant pathogens for humans are *E. faecalis* and *E. faecium*. These organisms are likely to affect patients who are elderly or whose normal microbiota has been altered by antibiotic treatment.²⁴ Furthermore, in neonates, *E. faecalis* is associated with a 6% mortality rate in early-onset septicaemia (EOS) which increases to 15% in late-onset (LOS) infections, whilst in general it is implicated in 7% to 50% of fatal cases.²⁵ *E. faecalis* is considered to increase *tst* expression leading to increased production of toxic shock syndrome toxin-1 thus increasing the virulence of *S. aureus*. Enterococci are believed to be difficult to treat because of their intrinsic resistance to antibiotics including beta-lactams and aminoglycosides which are frequently used to treat infections due to Gram-positive cocci. Resistance to trimethoprim, gentamycin and vancomycin have also been reported by.²⁶

The presence of *E. faecalis* in the amniotic fluid considerably increases the risk of histological inflammation of the placenta and also increases the risk for bronchopulmonary dysplasia (and necrotizing enterocolitis).²⁷

According to the National Healthcare Safety Network and Centers for Disease Control and Prevention, *S. aureus* and *Enterococcus sp.* are the two most commonly reported pathogens, accounting for 15.6% and 13.9% of healthcare-associated infections, respectively. In particular, *S. aureus* is notorious for its ability to acquire resistance to any antibiotic during the treatment of infection-associated infertility.²⁸

CONCLUSION

This study revealed *Staphylococcus aureus* had a high prevalence among the pregnant women in the study area thus suggesting a possible infection. Though, *Enterococcus sp.* prevalence was quite moderate. However, knowing the pathogens associated with infections among pregnant women is beneficial in the management and better planning of future medical treatments. Maintaining a healthy vaginal status during

pregnancy is vital to the control of opportunistic infection which may result in poor pregnancy outcomes. In addition, pregnant women should be screened early in their pregnancies, between the 12th and 16th weeks which is the second trimester of pregnancy.

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