Archives of Pharmaceutical Sciences and Biotechnology Journal

Volume 5 Issue 1 June, 2025 ISSN: 2971_611X

https://doi.org/10.47514/10.47514/APSBJ.2025.5.1.009

APSB Journal

Page 123 - 133 Submitted 11/11/2024 Accepted 13/1/2025

ARCHIVES OF PHARMACEUTICAL SCIENCES AND BIOTECHNOLOGY JOURNAL

VOLUME 5 ISSUE 1, JUNE 2025

ISSN 2971 – 611X

Archives of Pharmaceutical Sciences and Biotechnology Journal

Volume 5 Issue 1 June, 2025 ISSN: 2971_611X

https://doi.org/10.47514/10.47514/APSBJ.2025.5.1.009

APSB Journal

Page 123 - 133 Submitted 11/11/2024 Accepted 13/1/2025

Published by the Faculty of Pharmaceutical Sciences, Kaduna State University, Kaduna

ANTIBIOTIC SUSCEPTIBILITY PROFILE OF *STAPHYLOCOCCUS AUREUS* ISOLATED FROM PREGNANT AND NON –PREGNANT WOMEN ATTENDING DALHATU ARAF SPECIALIST HOSPITAL LAFIA

Ndubuisi John Chima, and Joseph Jessica Nandir.

Department of Medical Laboratory Science, Federal University of Lafia

Correspondence: ndubuisijohn@yahoo.com; john.ndubuisi@medicine.fulafia.edu.ng; 08063216285

ABSTRACT

Aim: This study aimed to determine the antibiotic susceptibility pattern of *Staphylococcus aureus* isolated from pregnant and non-pregnant women attending Dalhatu Araf Specialist Hospital, Lafia. **Methods:** A total of 150 participants, comprising both pregnant and non-pregnant women, were recruited using a descriptive cross-sectional design and random sampling technique. Clean-catch midstream urine samples were collected, and data were obtained through structured questionnaires. The samples were cultured using standard microbiological techniques. Isolates were identified based on colonial morphology, Gram staining, and biochemical tests. Antimicrobial susceptibility testing was carried out using the Kirby–Bauer disk diffusion method. **Results:** The overall prevalence of *S. aureus* was 23.3%, with a higher occurrence in pregnant women (14.7%) compared to non-pregnant women (8.7%). Ciprofloxacin (91.4%) and pefloxacin (77.1%) showed the highest effectiveness against the isolates, while ampiclox (83%), cefuroxime (97%), and amoxicillin exhibited the highest resistance rates. Notably, isolates from pregnant women demonstrated greater susceptibility to ciprofloxacin and azithromycin than those from non-pregnant women. **Conclusion:** The study reveals a significant prevalence of *S. aureus* among women, particularly in pregnant individuals. The resistance observed against commonly used antibiotics underscores the need for continuous surveillance of antimicrobial susceptibility. Increased awareness on personal hygiene, rational antibiotic use, and routine screening is recommended to mitigate the risk of infections.

Keywords: *Staphylococcus aureus*, pregnancy, antibiotic resistance, susceptibility pattern, women

INTRODUCTION

Staphylococcus aureus is one of the Gram-positive cocci belonging to the family *Micrococcaceae*, which includes several species of medical and veterinary importance such as *S. aureus*, *S. epidermidis*, *S. agnetis*, *S. pseudintermedius*, *S. lutrae*, *S. intermedius*, *S. hyicus*, *S. delphini*, *S. cornubiensis*, and *S. schleiferi* subsp. *coagulans*. *S. aureus* commonly colonizes the human body as part of the normal flora of the skin, nasal mucosa, upper respiratory tract, and the female lower genital tract (1,2). It has emerged as a significant human pathogen and, over the years, has become a leading cause of both hospital- and community-acquired infections. These infections range from mild skin conditions to severe diseases such as bacteremia and pneumonia. The pathogenicity of *S. aureus* is largely due to its wide array of virulence factors that elicit a strong inflammatory response (3, 4).

Pregnant women are more prone to vaginal colonization by *S. aureus* than non-pregnant women, possibly due to increased estrogen and blood glucose levels during pregnancy. The rate of *S. aureus* carriage varies among pregnant women (5). Since the introduction of antimicrobials, bacteria have evolved mechanisms to resist antibiotic effects. The

Archives of Pharmaceutical Sciences and Biotechnology Journal

Volume 5 Issue 1 June, 2025 ISSN: 2971_611X

https://doi.org/10.47514/10.47514/APSBJ.2025.5.1.009

APSB Journal

Page 123 - 133 Submitted 11/11/2024 Accepted 13/1/2025

emergence of multidrug resistance among Gram-positive bacteria—including streptococci, enterococci, and staphylococci—poses a significant public health challenge. *S. aureus* remains particularly concerning due to its high virulence, adaptability, and the broad spectrum of diseases it can cause. This issue is exacerbated in developing countries, where antibiotic misuse is widespread (6).

Therefore, this study aimed to determine the antibiotic susceptibility pattern of *Staphylococcus aureus* isolated from pregnant and non-pregnant women attending Dalhatu Araf Specialist Hospital, Lafia, in order to assess the prevalence, resistance trends, and potential implications for infection control and public health.

MATERIALS AND METHODS

Study Area

The study was carried out at Dalhatu Araf Specialist Hospital (DASH) in Nasarawa state. The latitude and longitude of DASH is approximately 8.5514° N, (latitude) and 7.7011° E (longitude). Nasarawa State is located in the central part of Nigeria and it's estimated to have a population of approximately 2.8 million people (City population, 2024). The major occupation of the population is Agriculture, trade and commerce, civil service, and small-scale industries (e.g., food processing, craft).

Study Design

This was a hospital based cross-sectional analysis to determine the clinical, and microbiological distribution of *Staphylococcus aureus* and susceptibility pattern among women that attended the hospital.

Study Population

The study comprised of consenting pregnant and non-pregnant women attending obstetrics and gynaecology clinic at Dalhatu Araf Specialist Hospital in Nasarawa state.

Inclusion Criteria

Any consenting pregnant and non-pregnant woman attending obstetrics and gynaecology clinic at the hospital.

Women between the age of 14 years (whose guardian gives consent) and above.

Exclusion Criteria

Any woman who did not give her consent or consent was not given by guardian.

Menstruating women.

Ethical Consideration

Ethical approval (DASHREC430) was obtained from the Ethics and Research Committee of Dalhatu Araf Specialist Hospital in Nasarawa state.

Informed Consent

Informed consent was obtained from the participants who are from the age of 18 and above, for those ranging from 14 to 17years, consent was obtained from their guardian/parents.

Sample Size Determination

The sample size was obtained using Thrusfield formula (7)

$$n = \frac{(1.96)^2 \times P_{exp}(1-P_{exp})}{d^2}$$

P_{exp} = expected *S. aureus* infection rate is 10.0%

n = 1.96^2 × 0.10 × (1-0.10)/0.05^

n = 3.8416 × 0.10 × 0.90/0.0025

n = 0.3457/0.0025 =138.29

n ≈138

Minimum sample size = 138. Therefore, a sample size of 150 participants was considered.

Sampling and Method of Data Collection

Archives of Pharmaceutical Sciences and Biotechnology Journal

Volume 5 Issue 1 June, 2025 ISSN: 2971_611X

https://doi.org/10.47514/10.47514/APSBJ.2025.5.1.009

APSB Journal

Page 123 - 133 Submitted 11/11/2024 Accepted 13/1/2025

The consenting patients were randomly selected from the women attending obstetrics and gynaecology clinic at the hospital. A structurally designed questionnaire was used for obtaining information such as their age, level of education, gestational age, occupation, and location of residence from the consenting patients.

Specimen Collection and Processing

Clean-catch early morning mid-stream urine sample was collected by each patient using sterile universal bottle containing boric acid which was given to them. Each batch of urine samples collected was taken immediately to the laboratory for analysis.

Laboratory Analysis

Culture

Each urine sample was properly mixed and inoculated onto CLED (Cystine Lactose Electrolyte Deficient) and Mannitol salt agar plates using sterilized calibrated wire loop delivering 0.002ml of urine. The agar plates were incubated at 37°C for 24 hours for possible isolation of bacterial colonies.

Urinalysis

Macroscopic examination was performed on the urine samples noting their colour and turbidity. Urine chemistry was performed on the samples using the dip stick method with Combi 9^{TM} and colour changes depicting the presence of some vital parameters such as protein, nitrite, leucocyte esterase, glucose was noted. The urine samples were centrifuged and examined microscopically for the presence of White Blood Cells (WBC), Red Blood Cells (RBC), casts, yeast cells, bacteria. Bacteriuria is typically associated with pyuria, which is considered significant when more than 10 white blood cells (WBCs) per high-power field (HPF) are observed (Cheesbrough, 2010).

Macroscopic Examination

After incubation, the plates were examined macroscopically and samples with growths showing uniform colonial morphology with a count greater than 105 colony-forming unit (CFU) per milliliter (ml) of urine were regarded as having significant bacteriuria (9). The morphological characteristics of the isolates on the agar plates were noted.

Microscopic Examination of Colonies

The Gram staining technique (9) was done on pure cultures obtained from samples exhibiting significant bacteriuria, and their Gram reaction was recorded. Pure colonies from each sample were sub-cultured onto nutrient agar slants and incubated at 37°C for 24 hours.

Biochemical tests

The bacterial isolates were identified using biochemical tests as a result of their cultural characteristics and Gram reaction. The tests include catalase test, coagulase test, oxidase test, and DNase test.

Antibiotic Susceptibility tests

Pure bacterial isolates from the samples with significant bacterial growth were subjected to antibiotic susceptibility testing using the Kirby-Bauer disc diffusion method. The antibiotic agents used included levofloxacin (5ug), pefloxacin (5µg), ciprofloxacin (5µg), erythromycin (15µg), ampiclox (10µg), cefuroxime (30µg), amoxicillin (30µg), ceftriaxone (30µg), gentamicin (30µg), and azithromycin (15µg).

Statistical Analysis

Data collected is recorded on excel spreadsheet and statistical analysis is done using a statistical software SPSS version 26. Results were expressed in Figures and Tables, mean (standard deviation) and student T- test was used for test statistics at $p<0.05$ significance level.

Archives of Pharmaceutical Sciences and Biotechnology Journal

Volume 5 Issue 1 June, 2025 ISSN: 2971_611X

https://doi.org/10.47514/10.47514/APSBJ.2025.5.1.009

APSB Journal

Page 123 - 133 Submitted 11/11/2024 Accepted 13/1/2025

RESULTS

One hundred and fifty (150) samples were obtained from women attending Dalhatu Araf Specialist Hospital, Lafia with 75 (50%) of them being pregnant while 75(50%) were non-pregnant as shown in Table 1. samples from the non-pregnant women but yielded 13(8.7%) of *S. aureus* and 27 (18%) of coagulase negative Staphylococci (CoNS). Pregnant women had more of the growth with *S. aureus* accounting for 14.7%, and 16.7% of the CoNS. These accounted for a total of 42% of samples with no bacterial growth while *S. aureus* accounted for 23.3%; and CoNS accounted for 34.7% from both women.

Table 1: Rate of *Staphylococcus aureus* infection among pregnant and Non-pregnant women

Pregnancy Status	Culture negative (%)	Staph aureus (%)	CoNS (%)	Total (%)
Non-Pregnant	35(23.3%)	13(8.7%)	27(18.0%)	75(50)
Pregnant	28(18.6%)	22(14.7%)	25(16.7%)	75(50)
Total	63 (42%)	35 (23.3%)	52 (34.7%)	150(100)

Key: CoNS: Coagulase negative Staphylococci.

Table 2 shows the distribution of infection in relation to age with 5.7% of *S. aureus* and 13.5% of CoNS isolated from ages 11-20 years. Ages 21-30years had 48.6% of *S. aureus* and 34.6% of CoNS growth; ages 31-40 years had 45.7% of *S. aureus* and 48.1% of CoNS growth; while ages 41-50% had no *S. aureus* growth and 3.8% of CoNS growth.

Table 2 distribution of infection in relation to age.

Age (years)	Frequency	Percent	Culture negative (%)	*S. aureus* (%)	CoNS (%)
(11-20)	9	6.0	0(0.0)	2(5.7)	7(13.5)
(21-30)	74	49.3	39(61.9)	17(48.6)	18(34.6)
(31-40)	63	42.0	22(34.9)	16(45.7)	25(48.1)
(41-50)	4	2.7	2(3.2)	0(0.0)	2(3.8)
Total	150	100	63 (100)	35 (100)	52 (100)

Key: CoNS: Coagulase negative Staphylococci.

Table 3 shows the educational background data of the participants revealed that majority of the women (51.3%) attended primary education, while 41.3% did attained secondary education, and only 7.3% attended tertiary education. The distribution of the isolates in relation to education with 49.2% of samples from women who attended primary showing no growth, and 51.4% of *S. aureus* and 54% of CoNS isolates. Those with secondary school education had 48.6% of *S. aureus* and 42% of CoNS growth. Those with tertiary education had no isolate of *S. aureus* and 4.0% of CoNS.

Table 3. Distribution of infection in relation to education.

Education	Frequency	Percent (%)	Culture negative (%)	*S. aureus* (%)	CoNS (%)
Primary	77	51.3	31 (49.2)	18 (51.4)	28 (54.0)
Secondary	62	41.3	23 (36.5)	17 (48.6)	22 (42.0)

Archives of Pharmaceutical Sciences and Biotechnology Journal

Volume 5 Issue 1 June, 2025 ISSN: 2971_611X

https://doi.org/10.47514/10.47514/APSBJ.2025.5.1.009

APSB Journal

Page 123 - 133 Submitted 11/11/2024 Accepted 13/1/2025

Tertiary	11	7.3	9 (14.3)	0 (0.0)	2 (4.0)
Total	150	100	63(100)	35(100)	52(100)

Key: CoNS: Coagulase negative Staphylococci

Table 4 shows the level of awareness in the study with 97.3% of the participants aware of the risk factors for *S. aureus* while 2.7% are not aware. Those who had recurrent infection were 97.3% as compared to 4.7% participants who did not. Different symptoms were observed ranging from burning sensation (24%), frequent urination (10%), back pain (15.3), and vaginal discharge (50.7%).

Table 4: Level of Awareness of *S. aureus* infection.

		Frequency	Percentage (%)
Awareness	No	4	2.7
	Yes	146	97.3
Recurrent infection	Yes	146	97.3
	No	2.7	4.7
symptoms	Burning sensation	36	24.0
	Frequent urination	15	10.0
	Back pain	23	15.3
	Vagina discharge	72	50.7
Sex during pregnancy	Yes	72	48.0
	No	78	52.0

Table 5 shows the susceptibility of the isolates. The isolates showed sensitivity to 77.1% and 22.9% resistance to pefloxacin; 45.7% sensitivity and 54.3% resistance to Gentamicin; 17.1% sensitivity and 82.9% resistance to ampiclox; 2.9% sensitivity and 97.1% resistance to cefuroxime; 5.7% sensitivity and 94.3% resistance to amoxicillin; 34.3% sensitivity and 65.7% resistance to ceftriaxone; 91.4% sensitivity and 8.6% resistance to ciprofloxacin; 74.3% sensitivity and 25.7% resistance to azithromycin; 62.9% sensitivity and 37.1% resistance to levofloxacin; 40% sensitivity and 60% resistance to erythromycin.

Table 5: Susceptibility and Resistance pattern of *S. aureus* to Antibiotics

Antibiotic (concentration)	Sensitive	Resistance
Pefloxacin	27(77.1%)	8(22.9%)
Gentamicin	16(45.7%)	19(54.3%)
Ampiclox	6(17.1%)	29(82.9%)
Cefuroxime	1(2.9%)	34(97.1%)
Amoxicillin	2(5.7%)	33(94.3%)
Ceftriaxone	12(34.3%)	23(65.7%)

Archives of Pharmaceutical Sciences and Biotechnology Journal

Volume 5 Issue 1 June, 2025 ISSN: 2971_611X

https://doi.org/10.47514/10.47514/APSBJ.2025.5.1.009

APSB Journal

Page 123 - 133 Submitted 11/11/2024 Accepted 13/1/2025

Ciprofloxacin	32(91.4%)	3(8.6%)
Azithromycin	26(74.3%)	9(25.7%)
Levofloxacin	22(62.9%)	13(37.1%)
Erythromycin	14(40.0%)	21(60.0%)

Table 6 shows the susceptibility and resistance of the isolates among the participants. The isolates showed 48.6% sensitivity and 14.3% resistance from pregnant women and 28.6% sensitivity and 8.6% resistance from non-pregnant women to pefloxacin; 31.4% sensitivity and 31.4% resistance from pregnant women and 14.3% and 22.9% from non-pregnant women to gentamicin; 8.6% sensitivity and 54.3% resistance from pregnant women and 8.6% sensitivity and 28.6% from non-pregnant women to Ampiclox; 0% sensitivity and 62.9 % resistance from pregnant women and 2.9% sensitivity and 34.3% resistance from non-pregnant women to cefuroxime; 0% sensitivity and 62.9% resistance from pregnant women and 5.7% sensitivity and 31.4% resistance from non-pregnant women to amoxicillin; 22.9 % sensitivity and 40% resistance from pregnant women and 34.3% sensitivity and 65.7% resistance from non-pregnant women to ceftriaxone; 57.1 % sensitivity and 5.7% resistance from pregnant women and 34.3% sensitivity and 2.9% resistance from non-pregnant women to ciprofloxacin; 45.7 % sensitivity and 17.1% resistance from pregnant women and 28.6% sensitivity and 8.6% resistance from non-pregnant women to azithromycin; 37.1% sensitivity and 25.7% resistance from pregnant women and 25.7% sensitivity and 11.4% resistance from non-pregnant women to levofloxacin; 25.7% sensitivity and 37.1% resistance from pregnant women and 14.3% sensitivity and 22.9% resistance from non-pregnant women to erythromycin.

Table 6: The Susceptibility and Resistance pattern of *S. aureus* to Antibiotic by Pregnancy Status

Antibiotic	Pregnancy Status	Sensitive	Resistance
Pefloxacin	Pregnant	17(48.6%)	5(14.3%)
	Non-Pregnant	10(28.6%)	3(8.6)
Gentamicin	Pregnant	11(31.4%)	11(31.4%)
	Non-Pregnant	5(14.3%)	8(22.9%)
Ampiclox	Pregnant	3(8.6%)	19(54.3%)
	Non-Pregnant	3(8.6%)	10(28.6%)
Cefuroxime	Pregnant	0(0.0%)	22(62.9%)
	Non-Pregnant	1(2.9%)	12(34.3%)
Amoxicillin	Pregnant	0(0.0%)	22(62.9%)
	Non-Pregnant	2(5.7%)	11(31.4%)
Ceftriaxone	Pregnant	8(22.9%)	14(40.0%)

Archives of Pharmaceutical Sciences and Biotechnology Journal

Volume 5 Issue 1 June, 2025 ISSN: 2971_611X

https://doi.org/10.47514/10.47514/APSBJ.2025.5.1.009

APSB Journal

Page 123 - 133 Submitted 11/11/2024 Accepted 13/1/2025

	Non-Pregnant	12(34.3%)	23(65.7%)
Ciprofloxacin	Pregnant	20(57.1%)	2(5.7%)
	Non-Pregnant	12(34.3%)	1(2.9)
Azithromycin	Pregnant	16(45.7%)	6(17.1%)
	Non-Pregnant	10(28.6%)	3(8.6%)
Levofloxacin	Pregnant	13(37.1%)	9(25.7%)
	Non-Pregnant	9(25.7%)	4(11.4%)
Erythromycin	Pregnant	9(25.7%)	13(37.1%)
	Non-Pregnant	5(14.3%)	8(22.9%)

DISCUSSION

Staphylococcal infections, while common in both pregnant and non-pregnant women, can pose unique risks during pregnancy, with increased vulnerability to certain infections and potential complications for both mother and baby. In this research, a total of 150 samples from pregnant (75%) and non-pregnant (75%) women participated as indicated in Table 1. It was observed that out of the 150 samples, pregnant and non-pregnant women accounted for 23.3% of *S. aureus* isolated while coagulase negative *Staphylococcus* (CoNS) species were 34.7%. The result obtained in this study concurs with earlier findings of Nsofor *et al*, (2016), who recorded 24.5% prevalence of *S. aureus* from different clinical specimens in Aba, South East Nigeria; Adirimo *et al*., (10) in a study conducted in Rivers state recorded 24.3% of *S. aureus* from both non-pregnant and post-partum women; Alshomrani *et al*. (11), isolated *S. aureus* (24%) from patients recruited for the study. A recent study Onoh *et al*., (12) had a prevalence of 20.6% in Abakaliki, Nigeria; and 20% by Maidawa *et al*., (13) in another study conducted Kaduna metropolis, Northwest of Nigeria. In a more recent study in Eastern Libya by Elabbar *et al*., (14), the prevalence recorded was 16.4%. Although this finding did not agree with studies carried out by Qaisar *et al*., (15) in Pakistan who recorded 28% of *Staphylococcus aureus* from urinary tract infection patients; Amaeze *et al*, (16), with (35.57%); Onyebueke, *et al*., (17), with 44.9%; Bwanga *et al*., (2) In Uganda with 55.3% and Stanley *et al*., (18) with 58.7% recorded. Onyebueke, *et al*., (17) also recorded a higher prevalence of other species of *Staphylococcus* spp with of 42.7%; while Onoh, *et al*. (12), recorded a much lower prevalence of other *Staphylococcus* species (7.1%). These differences in infection rates may have been due to the difference in sample sizes, sampling techniques, socio-cultural practices or selection criteria used in the studies**.**

Based on the prevalence rate between the pregnant and non-pregnant women, out of 23.3% of *S. aureus* isolated from this study, 14.7% accounted as the prevalence rate among pregnant women while 8.7% accounted for the prevalence among non-pregnant women. This comparative difference is in line with the work of Enupe *et al.*, (19) which had a prevalence rate of 14.3% among pregnant women and 5.5% among non-pregnant women. Most recent study carried out in Nigeria by Egbule *et al.*, (20), showed that 13.7% accounted for the prevalence among pregnant women while less than 5% accounted for non-pregnant women. The difference in percentage from pregnant and non-pregnant women can be due to change in

Archives of Pharmaceutical Sciences and Biotechnology Journal

Volume 5 Issue 1 June, 2025 ISSN: 2971_611X

https://doi.org/10.47514/10.47514/APSBJ.2025.5.1.009

APSB Journal

Page 123 - 133 Submitted 11/11/2024 Accepted 13/1/2025

hormone level and immune system function. Urinary tract infections (UTIs) account for approximately 25% of all infections in pregnant women and are among the most common bacterial infections in clinical settings (21). Pregnancy-related anatomical, physiological, and hormonal changes increase women's susceptibility to developing UTIs (21). These findings suggest a possible association of *S. aureus* with pregnancy having *S. aureus* more prevalent among pregnant women compared to CoNS. Prior studies suggests that this could be due to the fact that pregnant women have vaginal carriage of *S. aureus* than non-pregnant women because of their increased estrogen and blood glucose levels (5).

Table 2 shows that majority of the study population were between the ages of 21-30 years (49.3%), compared to those aged 11-20 years (6%). This showed similarity with the studies of Onyebueke, *et al*., (17), and above the records by Adirimo *et al.,* (10) with 34% of participants age between 20 -25years as majority. The high participants within the age ranges 21–30 and 31-40 could be attributed to this group being the most reproductively active and experiencing heightened sexual exposure during these years. A high prevalence of *S. aureus* was observed among women in the 21–30 and 31–40 years age groups. This finding aligns with the study by Adirimo *et al*. (10), which reported a high occurrence of *S. aureus* in women aged 20–25 years, as well as the findings of Adebola and Godwin (22), who recorded a similar trend in the 21–30 age group. However, Johnson *et al*., (21) and others have found that teenagers have high prevalence of UTI in pregnancy while some other studies have found no association between age and UTI in pregnancy (21). The increased susceptibility in these age groups may be attributed to heightened sexual activity and the physiological changes associated with childbearing. Additionally, studies have suggested that hormonal fluctuations, frequent healthcare exposure, and potential alterations in vaginal or skin microbiota could contribute to the higher colonization rates observed in these women.

The educational demography of the participants shows that those with primary education had the highest participation with 51.3% compared to those with secondary education with 41.3% and tertiary education with 7.3%. In our study, the incidence of UTI was more prevalent among respondents with primary education. There is a correlation between significant bacteriuria and the level of education (23). This observation suggests that individuals with lower or moderate education levels may lack adequate information sources regarding UTIs, potentially leading to an increased incidence of UTIs (23). Low socioeconomic status is associated with higher UTI prevalence in pregnancy in studies from other countries such as Bangladesh, Egypt, Ethiopia, and Pakistan (21). Education empowers women to make informed decisions about their health, leading to better prevention and management of infections, while also reducing the spread of diseases.

The study observed there was a high level of awareness (97.3%) of the causes of *S. aureus*, which is in accordance to the studies done by Adirimo *et al*., (10). The study population showed a high level of recurrent urinary tract infections (97.3%), with symptoms of vaginal discharge (50.7%) which also agrees with Egbule *et al.,* (20).

Based on the susceptibility findings, ciprofloxacin (91.4%) was the most effective antibiotics in this study, followed by pefloxacin (77.1%), azithromycin (74.3%) and levofloxacin (62.9%) which was moderately effective. The isolates showed the highest level of resistance to cefuroxime (97.1%), followed by amoxicillin (94.3%), ampiclox (82.9%), erythromycin (60.0%), ceftriaxone (65.7%)

Archives of Pharmaceutical Sciences and Biotechnology Journal

Volume 5 Issue 1 June, 2025 ISSN: 2971_611X

https://doi.org/10.47514/10.47514/APSBJ.2025.5.1.009

APSB Journal

Page 123 - 133 Submitted 11/11/2024 Accepted 13/1/2025

and gentamicin with 54.3%. This finding is in accordance to those recorded by Onyebueke *et al*., (17), in which the antibiotic susceptibility profile of *S aureus* revealed 65% susceptibility to ciprofloxacin, 72.5% of the isolates susceptible to levofloxacin. Though reverse is the case for the high resistance noted in amoxicillin (94.3%) and ampiclox (82.9%) in our findings as the susceptibility test carried out by Onyebueke *et al*., (17) showed high sensitivity of the isolates to amoxicillin (52.5%) and ampiclox (60.0%).

More recent studies carried out by Elabbar *et al*., (14) recorded that augmentin, ciprofloxacin, and nitrofurantoin, had susceptibility rate of 58.9%, 52.6% and 51.3% respectively while azithromycin, and nalidixic acid were very resistant to most uropathogens. The difference in the findings could be due to the different antibiotics' brands and strength of the antibiotics used for this study. The low activity of these antibiotics can also be attributed in part to earlier exposure of the isolates to these drugs, which may have enhanced resistance development. This assertion can further be strengthened by the high level of antibiotic abuse in our locality, arising from self-medication, failure to comply with treatment, antibiotic sale behaviour which includes, sale of antibiotics without prescription, sale of under dose and substituting brands.

From this study it was observed that the isolates demonstrated higher sensitivity for ciprofloxacin in both pregnant women (57.1%) and non-pregnant women (34.3%), The isolates from pregnant women were more resistant to cefuroxime and amoxicillin which were both 62.9%, followed by ampiclox (54.3%), while non-pregnant women were more resistant to ceftriaxone (65.7%) followed by cefuroxime (34.3%). This high antimicrobial resistance level could be attributed to self-medications, dug misused and drug abuse that would have resulted to resistance and subsequent manifestations.

CONCLUSION

This study revealed the prevalence of *Staphylococcus aureus* and non-coagulase Staphylococci (CoNS) among pregnant women and non-pregnant women. It also elucidated the difference in antibiotic susceptibility and resistance pattern to isolates from pregnant and non-pregnant women. Isolates from pregnant women showed higher sensitivity to certain antibiotics, such as Ciprofloxacin and Azithromycin, while those from non-pregnant women exhibited higher resistance rates to antibiotics like ampiclox, cefuroxime, and amoxicillin. There is need for further investigation into the extent and impact of *S. aureus* infection in pregnancy, neonatal, and maternal health and regular Staphylococcal screening of women should be greatly encouraged.

REFERENCES

1. Cheung, G. Y. C., Bae, J. S., and Otto, M. (2021). Pathogenicity and virulence of *Staphylococcus aureus*. *Virulence*, 12 (1):547–569.

2. Bwanga, F., Mukashyaka, C., Kateete, D. P., Okeng, A., Namugga, O., Tumuhamye, J., Kwizera, R., Sommerfelt, H., and Nankabirwa, V. (2023). Vaginal colonization with virulent *Staphylococcus aureus* and methicillin resistant *Staphylococcus aureus* among Ugandan women in labour. *Research square*, 1 – 19.

3. Jombo, G. T .A., Akpan, S., Epoke, J., Akaa, P. D. and Eyong, K. I. (2010) Antimicrobial susceptibility profile of community acquired and nosocomial isolates of *Staphylococcus aureus* and that of coagulase negative staphylococci from clinical blood culture specimens at a Nigerian University Teaching Hospital. *Journal of Clinical Medicine and Research*, 2(6): 83-90.

4. Nsofor, C. A., Ohale, C. U., and Nnamchi, C. I. (2015) Distribution and Antibiotics

Archives of Pharmaceutical Sciences and Biotechnology Journal

Volume 5 Issue 1 June, 2025 ISSN: 2971_611X

https://doi.org/10.47514/10.47514/APSBJ.2025.5.1.009

APSB Journal

Page 123 - 133 Submitted 11/11/2024 Accepted 13/1/2025

Susceptibility Pattern of *Staphylococcus aureus* isolates from Health Care Workers in Owerri, Nigeria. *Scholarly Journal of Biological Science*, 4(4): 29-32.

5. Lin, J., Wu, C., Yan, C., Ou, Q., Lin, D., Zhou, I., Ye, X., and Yao, Z. (2018). A prospective cohort study of *Staphylococcus aureus* and methicillin-resistant *Staphylococcus aureus* carriage in neonates: the role of maternal carriage and phenotypic and molecular characteristics. *Infection and Drug Resistance*, 11: 555–565.

6. Nsofor, C. A., Nwokenkw, V. N., and Ohale, C. U. (2016). Prevalence and Antibiotic Susceptibility Pattern of *Staphylococcus aureus* Isolated from Various Clinical Specimens in South East Nigeria. *MOJ Cell Science and Report*, 3(2): 00054.

7. Thrusfield MV (1995). Veterinary Epidemology. 2nd edition. Blackwell Science, Oxford. P 83.

8. Cheesbrough, M. (2010). District Laboratory Practice in Tropical Countries. Second Edition Update Part 2. Cambridge Low Price Edition. Cambridge University Press, The water Club, Beach Road, Granger Bay, Cape Town 8005, *South Africa*,107-115.

9. Ochie, J. O., and Kolhatkar, A.A. (2000). Medical Laboratory Science. Theory and practice. Diagnosis of infection by anatomic site: Urine. Tata McGraw-Hill publishing company limited, 7 west Patel Nagar, New Delhi 110008, 615-643.

10. Adirimo, D. E., Akani, N. P., and Sampson, T. (2023). Prevalence of *Staphylococcus aureus* among Female Patients Attending Rivers State University Teaching Hospital (RSUTH) in Port Harcourt, Nigeria. *Asian Journal of Research in Infectious Diseases*, 13(1): 5-15.

11. Alshomrani, M. K., Alharbi, A. A., and Alshehri, A. A. (2023). Isolation of *Staphylococcus aureus* Urinary Tract Infections at a Community Based Healthcare Center in Riyadh. *Cureus* 15(2): e35140.

12. Onoh, R. C., Umeora, O. U. J., Egwuatu, V. E., Ezeonu, P. O., and Onoh, T. J. P. (2022). Antibiotic sensitivity pattern of uropathogens from pregnant women with urinary tract infection in Abakaliki, Nigeria. *Infection and Drug Resistance*, 225-233.

13. Maidawa, G. Z., Orukotan, A. A., and Abdulfatai, K. (2021). Occurrence of methicillin-resistant *Staphylococcus aureus* isolated from patients attending some hospitals within Kaduna metropolis. *Science World Journal*, 16(3):320-324.

14. Elabbar, F., Elgtani, W., Bodalal, F., Mansur, K., Elzahaf, R. (2024). Urinary Bacterial Profile and Antibiotic Susceptibility Pattern among pregnant Women in Eastern Libya. *AlQalam journal of Medical and Applied Sciences*, 945-954.

15. Qaisar, A., IsrR, A., Saeed, I., Aahfaq, E., Shaukat, L., & Haider, F. (2024). Investigation of Uropathological Bacterial Profile and Antibiotic Susceptibility Patterns Among Pregnant Women in Rawalpindi and Islamabad. A comprehensive Analysis. *Journal of Health and Rehabilitation Research*, 4(1), 1391 – 1396.

16. Amaeze, N. J., Abah, A. U., and Okoliegbe, I. N. (2013). Prevalence and antibiotic susceptibility of uropathogens among patients attending University of Abuja Teaching Hospital, Gwagwalada, Abuja. *International Journal of Medicine and Medical Science*. 5(10): 460-466.

17. Onyebueke, E. A., Onyemelukwe, N.F., and Sofoluke, D.O. (2019). Antibiotic Susceptibility Pattern of *Staphylococcus* Species Implicated in Urinary Tract Infection in Enugu State Nigeria. *Pharmacologyonline* 1:166-176.

18. Stanley, C. N., Ugboma, H. A., Ibezim, E. C., and Attama, A. A. (2013) Prevalence and antibiotic susceptibility of *Staphylococcus aureus* and other Staphylococcal infections in pregnant women attending antenatal clinic in a tertiary Hospital in Port Harcourt. *Journal of Infectious Disease and Therapy*, 2(1):125.

19. Enupe, O., Joel, H., Micah and Adeoye. C. (2023). Prevalence of *Staphylococcus aureus* In Urine among Pregnant and Non Pregnant Women Attending Federal Medical Center Keffi. *Journal of Current Research*, 8(9),23-65.

Archives of Pharmaceutical Sciences and Biotechnology Journal

Volume 5 Issue 1 June, 2025 ISSN: 2971_611X

https://doi.org/10.47514/10.47514/APSBJ.2025.5.1.009

APSB Journal

Page 123 - 133 Submitted 11/11/2024 Accepted 13/1/2025

20. Egbule. O., Morka E., and Omenogor P. (2024).Prevalence of *Staphylococcus aureus* Amomg Women attending General Hospitals in Delta, Nigeria. *Journal of Drug Delivery.* 14(3):22-26.

21. Johnson B, Stephen BM, Joseph N, Asiphas O, Musa K, Taseera K. (2021). Prevalence and bacteriology of culture-positive urinary tract infection among pregnant women with suspected urinary tract infection at Mbarara regional referral hospital, South-Western Uganda. *BMC Pregnancy Childbirth*, 21(1):159. doi: 10.1186/s12884-021-03641-8. PMID: 33622283; PMCID: PMC7903640.

22. Adebola O, Godwin O. (2012). Antimicrobial resistance of *S. aureus* strains from patients with urinary tract infections in Yenagoa, Nigeria. *Journal of Pharmacy and Bioallied Sciences*, 4(3):226-230.

23. Aleinein A.I, and Salem Sokhn E. (2024). Knowledge and prevalence of urinary tract infection among pregnant women in Lebanon. Heliyon. 10(17):e37277. doi: 10.1016/j.heliyon.2024.e37277. PMID: 39296194; PMCID: PMC11408011.