Comparative Assessment of the Efficacy of Selected Antibiotics against Bacterial Isolates from Wound and Urinary Tract Infections

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Abstract: This study conducted a comparative assessment of the efficacy of selected antibiotics against bacterial isolates from wound and urinary tract infections from Alex-Ekwueme Federal Teaching Hospital in Abakaliki, Ebonyi State, Nigeria using antimicrobial disc diffusion method. Bacteria were isolated from wound and urine samples, the isolates were identified through biochemical tests and were all confirmed before usage. The isolates including *Escherichia coli, Klebsiella pneumoniae, Staphylococcus aureus,* and *Streptococcus faecalis* were used. Antibiotic susceptibility pattern was done using commonly used antimicrobial agents which includes Azithromycin tagged (AZ) 15/µg, Ofloxacin 2meg tagged (OF) 2/µg and Gentamicine (GEN)10/µg. Also, synergistic effects of Cefuroxime + clavulanic acid tagged (STx) 30/10µg and Ceftriaxon + sulbactam tagged (CS) 30/15µg were as carried out using double disc diffusion method through standard antibiotic susceptibility test. The results revealed varied sensitivity patterns against the isolates. Overall sensitivity of the isolates was 583 out of 800 Ceftriaxone demonstrated the highest sensitivity against *Escherichia coli* and *K. pneumoniae*, while Gentamicin was most effective against *Staphylococcus aureus*, and *Streptococcus faecalis*. Also, the highest sensitivity shows to be on *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Escherichia coli*. The result concludes that Ceftriaxone and sulbactam has the highest percentage sensitivity (82.0%), followed by gentamicin (42%), making them strong antibiotic for empirical treatment of both wound and urinary tract infections. The study recommends for antibiotic regimen programs to combat resistance and optimize patient outcomes. Additionally, the study calls on hospitals to adopt robust antimicrobial regimen programs to monitor and regulate the use of antibiotics, minimizing the misuse or overuse of these drugs to reduce antibiotic resistance and enhance effective treatment.
Key word: Antibiotics, resistance, antimicrobial regimen, urinary tract infections

INTRODUCTION

Wound and urinary tract infections (UTIs) represent two of the most prevalent types of infections in clinical settings, causing significant health challenges globally. Wound especially those resulting from surgery or chronic conditions, provide an optimum environment for the growth of pathogenic microorganisms. Similarly, urinary tract infections, often caused by bacteria that colonize the urinary system, are among the most frequent bacterial infections cosmopolitantly affecting women, elderly individuals, and patients with indwelling catheters. These infections, if not properly managed/treated, can lead to severe complications such as sepsis, tissue damage, and even organ failure (Okonko and Soleye, 2021). Antibiotic therapy remains a primary line of treatment for both wound infections and UTIs. However, the increasing concern of antibiotic resistance complicates treatment outcomes. Bacterial pathogens responsible for these infections, such as *Staphylococcus aureus*, *Escherichia coli*, and *Pseudomonas aeruginosa*, have increasingly shown resistance to commonly used antibiotics. The emergence of multidrug-resistant strains not only reduces the efficacy of standard treatments but also increases the risk of treatment failure, prolonged hospital stays, and higher healthcare costs in all (Garneau-Tsodikova and Labby, 2016). This resistance makes it difficult to continuously assess the efficacy of available antibiotics against bacterial isolates from these infections to guide in choosing effective regimen treatment choices (Bowler, 2020).

Urinary Tract Infections (UTIs) comprises of varieties of infections involving the urinary tract. Among bacterial infections in adults, UTIs is the most prevalent of it all accounting for approximately 150 million cases annually (Tarnagda *et al.*, 2024). These infections manifest as nosocomial or acquired with different microorganisms or pathogenic microbial profiles (Foxman, 2020). Urinary tract infections, are mostly caused by *Escherichia coli*, but other bacteria such as *Klebsiella*, *Proteus*, and *Enterococcus* species also contribute. Resource-constrained regions, such as Burkina Faso, face with challenges related to the cost and accessibility of cytological and bacteriological urine analysis, especially in primary and intermediate healthcare facilities (Wilson, 2020). These limitations propel the adoption of antibiotic therapy as a result of local microbiological data (Mandell *et al.,* 2020). Consequently, inappropriate antibiotic regimens might contribute to escalating antibiotic consumption, contributing to the issue of antibiotic resistance. Moreover, the potential for renal complications stemming from inadequately managed UTIs also adds another rising issue of concern (Wang *et al*., 2022).

Post-operative wound infections, wound infections in general and UTIs have remained one of the major causes of morbidity among the hospitalized patients according to Emmerson *et al*. (2020). Surgical infections and UTIs account for 12.3% and 18.7% of all hospital-acquired infections respectively. These infections are becoming major concern among patients and healthcare practitioners as a result of its increased toll on morbidity and associated financial loss. This research is meant to help both surgeons and clinicians to know the antibiotic susceptibility pattern as it relates to the surgical site and general wound which can help reduce postoperative complications and UTI (Zaman *et al*., 2021). Therefore, the present study conducted a comparative assessment of the efficiency of selected antibiotics against bacterial isolates from wound and urinary tract infections (Rebollo *et al.,* 2019).

MATERIALS AND METHODS

Sample Collection: Samples were collected from Alex-Ekwueme Federal Teaching Hospital Abakaliki. The targeted organisms were bacteria isolates from wound and urinary tract of patients in Alex-Ekwueme Federal Teaching Hospital Abakaliki. The bacteria isolates were those ones already typed, well identified through biochemical tests. Those isolates were all reconfirmed before use.

Gram Stain: This was used to reconfirm the gram reactions of the five organisms. It was discovered that those ones that were gram negative were actually gram negative, such as *Escherichia coli*, *Klebsiella pneumoniae* and those ones identified as gram positive were actual gram positive, such as *Staphylococcus aureus* and *Streptococcus faecalis* (Cheesbrough, 2003; Ochei & Kolhatkar, 2008).

Motility Test: A drop of suspension of the *Klebsiella pneumoniae* was dropped on a clean grease free slide and covered with a cover slip after sealing the edges of the cover slip with vaseline, the preparation was examined for motility *Klebsiella pneumoniae* was non-motile, differentiating it from *Escherichia coli* which was motile and both lactose fermenters, on MacConkey Agar. (Cheesbrough, 2003; Ochei and Kolhatkar, 2008)

Catalase Test: This was used to differentiate *Staphylococcus* and *Streptococcus* which is catalase negative. This was done by placing one drop of H_2O_2 on a slide and a colony of the organism was paired with edge of a slide, suspended on the H_2O_2, was watched closely, and it was observed that the staphylococcus species were catalase positive unlike *Streptococcus* spp. that were catalyze negative (Cheesbrough, 2003; Ochei and Kolhatkar, 2008).

Coagulase Test: This was used to pinpoint *Staphylococcus aureus* which was coagulase positive. A clean glass slide was used, a drop serum was dropped one side and a drop of normal saline was dropped on one side and, on each, a colony of the organism identified before as *Staphylococcus* spp. was emulsified both and rocked and watched closely and agglutination was observed confirming the *Staphylococcus aureus* (Cheesbrough, 2003; Ochei & Kolhatkar, 2008).

Triple Sugar Iron Agar Reaction: The tube for TSI was inoculated using straight wire, and it was discovered that *Klebsiella* spp. and *Escherichia coli* both showed yellow butt and yellow slope, the organism produced gas but no H_2S_2 (Monica Cheesbrough, 2003; Ochei and Kolhatkar, 2008).

Urease Test: This was used to differentiate *Klebsiella* from *Escherichia coli* which is Urease negative.

Preparation of Mac Farland's Standard: The turbidity standard was prepared by pouring 0.6ml of a 1% (10g/L) solution of Barum chloride dehydrate into 100ml graduated cylinder and filling to 100ml with 1% (10µg) sulphuric acid (WHO, 2003; (Ochei and Kolhatkar, 2008).

Preparation of Bacteria Suspension: The colonies of the organism selected were subcultured for purification. A flamed wire loop was aseptically touched on 3-5 colonies of the respective organisms to be tested on the purity plate and suspended in a tube similar to that used for the Macfarland's standard and shaken gently to ensure a uniform distribution of the cell and the tubes compared with the standard (WHO, 2003; Ochei and Kolhatkar, 2008).

Inoculation of the Sensitivity Plate: The bacteria suspension prepared was poured on a sensitivity plate and evenly distributed/spread on the surface of the solid agar plates. Nutrient agar for *Escherichia coli*, *Klebsiella pneumoniae*, *Staphylococcus aureus* except those ones that are β-hemdy strain and chocolate plate for *Streptococcus faecalis.* The plates were allowed to dry a bit before placing the sensitivity disc and were incubated at 37°C for 18-24 h. The discs were spaced enough to ensure easy measurements of the zones of inhibition, (Ochei and Kolhatkar, 2008).

Reading and Interpretation of Sensitivity Results: The sensitivity results were read and interpreted based on the guidelines provided by the National Council on Clinical Laboratory Standard which states that ≤ 9mm is resistant, 10 – 11 mm is intermediate sensitive and ≥ 12mm is sensitive (NCCL, 2001).

Antibiotics used in the Research: The following antibiotics were used; Cefuroxime + clavulanic acid tagged (STx) 30/10µg, Ceftriaxon + sulbactam tagged (CS) 30/15µg, Azithromycin tagged (AZ) 15/µg, Ofloxacin 2meg tagged (OF) 2/µg and Gentamicine (GEN)10/µg.

RESULTS

From Table 1 below; among all the *Escherichia coli* subjected to the effect of cefuroxime + clavulanic acid, only two (2) were resistance and those two were all from wound sample and non-from urinary tract infection. Five of each site gave intermediate zone of inhibition while 18 from wounded were sensitive while 20 from UTI were sensitive. The table also shows that *Klebsiella pneumoniae* were resistance to STX, and 3 were from wound, one (1) from UTI, 10 and 3 intermediate from wound and UTI respectively while sensitive were 12 and 21 from wounded and UTI respectively. For *Staphylococcus aureus*, 2 were resistance and both were from wound. 7, 3 and 16, 22 were intermediate and sensitive on wound and UTI respectively. For *Streptococcus faecalis*, 2, 2 and 4, 0 and 19, 23 were resistant, intermediate and sensitive on wound and UTI respectively.

There is no significant relationship between wound and urine of resistant, intermediate, and sensitive of isolated microorganisms on Cefuroxime + Clavulanic Acid (STX) ($P>0.05$) except *Klebsiella pneumoniae* ($P<0.05$). This implies that the percentage of wound that is intermediate in *Klebsiella pneumoniae* (14.0%) is significantly higher than that of the urine (6.0%), while the percentage of urine that is sensitive in *Klebsiella pneumoniae* (42.0%) is significantly higher than that of the wound (24.0%). Table 2 below shows that among all the 200 isolates subjected to ceftriatxon + sulbactam, only 14 were resistance and out of this, 8 were from wound and 6 from UTI. 26 were intermediate and 164 were sensitive to ceftriaxon + sulbactam and out of this 164, 78 were from wound and 86 from UTI. There is no significant relationship between wound and urine of resistant, intermediate, and sensitive of isolated microorganisms on Ceftriaxone + sulbactam (P>0.05). Table 3 below showed that 12 *E. coli* isolates were resistance to azithromycin and 8 from wound sample and 4 from UTI. 17 gave intermediate, 8 from wound and 9 from UTI. Those that were sensitive were 21, 9 from wound and 12 from urine. Eight (8) *Klebsiella pneumoniae* resisted Azithromycin, 6 from wound and 2 from UTI, intermediate 10. 32 were sensitive, 13 from wound and 19 from UT. Four (4) *Staphylococcus aureus* resisted Azithromycin and all the four (4) from wound, and 31 were sensitive. Out of the 31, 11 were from wound and 20 from UTI. Four (4) *Streptococcus faecalis* were Azithromycin 2 from each site, sensitive 38, 15 from wound and 23 from UTI. There is no significant relationship between wound and urine of resistant, intermediate, and sensitive of *E. coli*, and *Klebsiella pneumoniae* isolated on Azithromycin (P>0.05). However, there is significant relationship between wound and urine of resistant, intermediate, and sensitive of *Staphylococcus aureus* and *Streptococcus faecalis* isolated on Azithromycin (P<0.05). This implies that the percentage of wound that is resistant and intermediate in *Staphylococcus aureus* (8.0%) and (20.0) respectively is significantly higher than that of the urine (0.0%) and (10.0%), while the percentage of urine that is sensitive in *Staphylococcus aureus* (40.0%) is significantly higher than that of the wound (22.0%). Similarly, that the percentage of wound that is intermediate in *Staphylococcus faecalis* (16.0%) is significantly higher than that of the urine (0.0%), while the percentage of urine that is sensitive in *Staphylococcus faecalis* (46.0%) is significantly higher than that of the wound (30.0%). The sensitivity pattern of isolated microorganisms on Ofloxacin as shown in table 4.4 below reveals that there is no significant relationship between wound and urine of resistant, intermediate, and sensitive of *Klebsiella pneumoniae* and *Staphylococcus aureus* isolated on Ofloxacin (P>0.05). However, there is significant relationship between wound and urine of resistant, intermediate, and sensitive of *E. coli*, and *Streptococcus faecalis* isolated on Ofloxacin (P<0.05). This implies that the percentage of wound that is resistant and intermediate in *E. coli* (20.0%) is significantly higher than that of the urine (2.0%), while the percentage of urine that is sensitive in *E. coli* (38.0%) is significantly higher than that of the wound (26.0%). Similarly, that the percentage of wound that is intermediate in *Staphylococcus faecalis* (12.0%) is significantly higher than that of the urine (0.0%), while the percentage of urine that is sensitive in *Staphylococcus faecalis* (48.0%) is significantly higher than that of the wound (32.0%). There is no significant relationship between wound and urine of resistant, intermediate, and sensitive of isolated microorganisms on Gentamicin (P>0.05).

Table 1: Sensitivity pattern of isolated microorganisms on Cefuroxime+ Clavulanic Acid (STX)

Bacteria Site Organism	Antibiotic Conc. 30/10µg	No of isolate	Resistant ≤ 9mm		Intermediate 10 – 11mm		Sensitive 12mm		χ^2 (P-value)
			Wound	Urine	Wound	Urine	Wound	Urine	
E. coli	Cefuroxime+ Clavulanic Acid (STX)	50	2(4.0)	0(0.0)	5 (10.0)	5(10.0)	18(36.0)	20(40.0)	2.111* (0.636)
Klebsiella pneumoniae	Cefuroxime+ Clavulanic Acid (STX)	50	3(6.0)	1(2.0)	10(20.0)	3 (6.0)	12(24.0)	21(42.0)	7.223* (0.024)
Staphylococcus aureus	Cefuroxime+ Clavulanic Acid (STX)	50	2(4.0)	0(0.0)	7 (14.0)	3 (6.0)	16(32.0)	22(44.0)	4.548* (0.116)
Streptococcus faecalis	Cefuroxime+ Clavulanic Acid 6(STX)	50	2(4.0)	2(4.0)	4 (8.0)	0 (0.0)	19(38.)	23(46.0)	4.382* (0.207)

Table 2: Sensitivity pattern of isolated microorganisms on Ceftriaxone + sulbactam

Bacteria Site Organism	Antibiotic Conc. 30/15µg	No of isolate	Resistant ≤ 9mm		Intermediate 10 – 11mm		Sensitive 12mm		χ^2 (P-value)
			Wound	Urine	Wound	Urine	Wound	Urine	
E. coli	Ceftriaxone + sulbactam	50	1(2.0)	0(0.0)	4(8.0)	2(4.0)	20(40.0)	23(46.0)	1.876* (0.303)
Klebsiella pneumoniae	Ceftriaxon + sulbactam	50	2(4.0)	1(2.0)	3(6.0)	2(4.0)	20(40.0)	22(44.0)	0.629* (0.745)
Staphylococcu saureus	Ceftriaxon + sulbactam	50	3(6.0)	1(2.0)	4(8.0)	4(8.0)	18(36.0)	20(40.0)	1.111* (0.704)
Streptococcus faecalis	Ceftriaxon + sulbactam	50	2(4.0)	0(0.0)	3(6.0)	4(8.0)	20(40.0)	21(42.0)	2.167* (0.539)

Table 3: Sensitivity pattern of isolated microorganisms on Azithromycin

Bacteria Site Organism	Antibiotic Conc. 15µg	No of isolate	Resistant ≤ 9mm		Intermediate 10 – 11mm		Sensitive 12mm		χ^2 (P-value)
			Wound	Urine	Wound	Urine	Wound	Urine	
E. coli	Azithromycin	50	8(16.0)	4(8.0)	8 (16.0)	9(18.0)	9 (18.0)	12(24.0)	1.819* (0.490)
Klebsiella pneumoniae	Azithromycin	50	6(12.0)	2(4.0)	6 (12.0)	4 (8.)	13(26.0)	19(38.0)	3.533* (0.194)
Staphylococcu s aureus	*Azithromycin*	50	4 (8.0)	0(0.0)	10(20.0)	5(10.0)	11(22.0)	20(40.0)	8.282* (0.013)
Streptococcus faecalis	Azithromycin	50	2 (4.0)	2(4.0)	8 (16.0)	0 (0.0)	15(30.0)	23(46.0)	9.677* (0.005)

Table 4: Sensitivity pattern of isolated microorganisms on Ofloxacin

Bacteria Site Organism	Antibiotic Conc. 2meg	No of isolate	Resistant ≤ 9mm		Intermediate 10 – 11mm		Sensitive 12mm		χ^2 (P-value)
			Wound	Urine	Wound	Urine	Wound	Urine	
E. coli	Ofloxacin	50	10(20.0)	1(2.0)	2 (4.0)	5(10.0)	13(26.0)	19(38.0)	9.777* (0.005)
Klebsiella pneumoniae	*Ofloxacin*	50	2 (4.0)	3(6.0)	7(14.0)	1 (2.0)	16(32.0)	21(42.0)	5.369* (0.095)
Staphylococcus aureus	Ofloxacin	50	3 (6.0)	3(6.0)	4 (8.0)	3 (6.0)	18(36.0)	19(38.0)	0.174* (1.000)
Streptococcus faecalis	Ofloxacin	50	3 (6.0)	1(2.0)	6(12.0)	0 (0.0)	16(32.0)	24(48.0)	8.597* (0.007)

Table 5: Sensitivity pattern of isolated microorganisms on Gentamicin

Bacteria Site Organism	Antibiotic Conc. 2mµg	No of isolate	Resistant ≤ 9mm		Intermediate 10 – 11mm		Sensitive 12mm		χ^2 (P-value)
			Wound	Urine	Wound	Urine	Wound	Urine	
E. coli	Gentamicin	50	2(4.0)	3(6.0)	7 (14.0)	7 (14.0)	18(36.0)	13(26.0)	0.691* (0.759)
Klebsiella pneumoniae	Gentamicin	50	3(6.0)	2(4.0)	6 (12.0)	16(32.0)	13(26.0)	10(20.0)	4.477* (0.099)
Staphylococcus aureus	Gentamicin	50	2(4.0)	3(6.0)	6 (12.0)	7 (14.0)	20(40.0)	12(24.0)	1.582* (0.430)
Streptococcus faecalis	Gentamicin	50	2(4.0)	3(6.0)	10(20.0)	6 (12.0)	9 (18.0)	20(40.0)	4.198* (0.571)

DISCUSSION

Management of wound infections including post-operative wound and urinary tract infections remains significantly a major concern for physicians globally. These infections represent two of the most frequently known infections in clinical settings, causing a significant healthcare challenge worldwide. The results of these sensitivity patterns for isolated microorganisms on various antibiotics demonstrated interesting trends in bacterial resistance and sensitivity across different antibiotics and sample types (wound and urinary tract infections). The results in Table 1 show that *Escherichia coli* isolates from wounds were more resistant (2 out of 50) to cefuroxime + clavulanic acid compared to urine samples, which had no resistance. *Klebsiella pneumoniae* also showed higher resistance in wound samples (3 resistant isolates) compared to UTI samples (1 resistant isolate). These results align with the work of Lilani *et al*. (2018), indicating that bacteria isolated from wounds often exhibit higher resistance compared to UTI isolates, possibly due to increased exposure to external contaminants and prior antibiotic treatments in wound cases. For *Staphylococcus aureus* and *Streptococcus faecalis*, resistance levels were low in both wound and urine samples, suggesting that cefuroxime + clavulanic acid may still be an effective treatment option against these bacteria. Studies like Okonko and Soleye (2021) is in support that these organisms typically show low resistance to beta-lactam antibiotics when combined with beta-lactamase inhibitors like clavulanic acid.

The findings in Table 2 showed that Ceftriaxone + Sulbactam is more effective, with a much lower number of resistant isolates (14 out of 200). This is consistent with the role of sulbactam as a beta-lactamase inhibitor, which helps overcome bacterial resistance, particularly in Gram-negative organisms like *E. coli* and *Klebsiella pneumoniae*. These results are in line with the work of Mustafa *et al*., (2020), that highlight the effectiveness of ceftriaxone + sulbactam in treating infections, especially UTIs. The low resistance observed in *E. coli* and *Klebsiella pneumoniae* isolates (both wound and urine) to ceftriaxone + sulbactam suggests that this antibiotic combination remains highly effective for treating these infections in both sample types. This aligns with findings from Brook *et al*. (2022), who concluded that ceftriaxone remains a preferred treatment for various infections, including respiratory and urinary tract infections.

The findings from Table 3 highlighted moderate resistance to azithromycin, especially for *E. coli* (12 resistant isolates) and *Klebsiella pneumoniae* (8 resistant isolates). Azithromycin's effectiveness has been questioned in some recent studies Johnson and Stamm (2020), particularly against Gram-negative organisms like *E. coli*, which often carry resistance genes against macrolides like azithromycin. *Staphylococcus aureus and Streptococcus faecalis* showed better sensitivity to azithromycin, reflecting its continued use in treating Gram-positive infections, though resistance is still a growing concern worldwide. The reduced sensitivity in *E. coli* and *Klebsiella pneumoniae* could be related to misuse or overuse of azithromycin in community-acquired infections, promoting the development of resistance. More so, Azithromycin also exhibited higher sensitivity on all the bacterial isolates with *Streptococcus faecalis* having susceptibility followed by *Klebsiella pneumoniae* from wound isolates. *E. coli* from wound showed the highest Azithromycin resistance while the least susceptibility was observed in *E. coli* followed by *Klebsiella pneumoniae*.

According to finding in Table 4, the resistance to Ofloxacin was relatively high among *E. coli* isolates from wounds (10 resistant out of 50). This is consistent with global trends, where fluoroquinolone resistance in *E. coli* has been rising due to overuse in both human and veterinary medicine. Ofloxacin resistance in *Klebsiella pneumoniae* and *Staphylococcus aureus* was lower compared to *E. coli*, indicating that it may still be an effective choice for treating these organisms, though monitoring for emerging resistance is important. *Streptococcus faecalis* also showed good sensitivity to Ofloxacin, which is expected, as fluoroquinolones generally have good activity against this pathogen. However, the 3 resistant wound isolates point to the need for cautious use of Ofloxacin to prevent further resistance development.

The results in Table 5 presented Gentamicin as having relatively good sensitivity, particularly in wound isolates of *Staphylococcus aureus* and *Streptococcus* *faecalis*, with more than 70% sensitivity in both organisms. Gentamicin is known for its effectiveness against Gram-positive organisms, and these results are in line with the work of Memom (2019) that demonstrate its continued utility in wound infections. However, for *E. coli* and *Klebsiella pneumoniae*, resistance was somewhat higher, especially in urinary tract isolates. This suggests that aminoglycoside resistance is becoming a more prominent issue in UTI treatment, mirroring findings from Hansson *et al*. (2021), where *E. coli* has been shown to develop resistance to gentamicin due to the acquisition of aminoglycoside-modifying enzymes.

In general, wound isolates exhibited higher resistance rates across all antibiotics, likely due to the nature of wound infections, which often involve more complex bacterial communities and repeated exposure to antibiotics. UTI isolates were generally more sensitive, especially for ceftriaxone + sulbactam and gentamicin, which aligns with Okonko and Soleye (2021), indicating these antibiotics are still effective for treating UTIs. Overall sensitivity isolates (583 out of 800) across all antibiotics indicates that while resistance is present, most antibiotics tested still retain substantial efficacy against the isolates. Notably, ceftriaxone + sulbactam had the highest sensitivity rate, followed by gentamicin, making them strong candidates for empirical treatment of both wound and urinary tract infections. According to Johnson and Stamm (2020) noted that wound infections, particularly in hospital settings, are more likely to harbor resistant organisms compared to UTIs. Moreover, the rising resistance to common antibiotics like azithromycin and ofloxacin in *E. coli* aligns with global AMR trends, where fluoroquinolones and macrolides are facing increasing resistance. Therefore, while ceftriaxone + sulbactam and gentamicin show promise for treating infections in this study, the rising resistance to azithromycin and ofloxacin warrants careful antibiotic stewardship to prevent further AMR development.

CONCLUSION

The study investigated the efficiency of selected antibiotics against bacterial isolates from wound and urinary tract infections at Alex Ekwueme Federal Teaching Hospital Abakaliki. The results showed varying levels of antibiotic resistance among the bacterial isolates, with *Escherichia coli, Klebsiella pneumoniae, Staphylococcus aureus*, and *Streptococcus faecalis* exhibiting different susceptibility patterns. Some bacterial strains, especially those from urinary tract infections, demonstrated higher sensitivity to antibiotics, while others, particularly wound isolates, displayed resistance to certain drugs. This highlights the growing issue of antibiotic resistance, which poses significant challenges to the effective treatment of infections. The study underscores the importance of routine antibiotic susceptibility testing to guide clinical treatment decisions. As antibiotic resistance continues to rise, using outdated or ineffective antibiotics can lead to treatment failures, prolonged hospital stays, and higher healthcare costs. Regular monitoring of bacterial resistance patterns is essential for adapting treatment protocols and ensuring the use of appropriate antibiotics that can combat infections effectively. The findings emphasize the need for local data on bacterial resistance trends to optimize patient care.

The sensitivity patterns highlight the importance of selecting the right antibiotic based on the infection site and the causative organism. The variations in resistance and sensitivity between wound and urine isolates for certain bacteria stress the need for site-specific treatments. Antibiotics like Ceftriaxone + Sulbactam and Ofloxacin show strong potential for treating both wound and urine infections, while Azithromycin may require cautious use due to its higher resistance rates in some cases. The study underscores the need for ongoing monitoring of bacterial resistance to optimize treatment outcomes. Therefore, the growing threat of multidrug-resistant bacteria necessitates a multifaceted approach, including the prudent use of antibiotics, continuous surveillance of resistance patterns, and the development of new antimicrobial agents. By implementing targeted interventions such as routine susceptibility testing and antimicrobial stewardship programs, healthcare facilities can improve patient outcomes, reduce the spread of resistant bacteria, and contribute to the global effort to combat antibiotic resistance.

Ethical Approval

Ethical clearance with reference number (AE-FUTHA/REC/VOL 7/2024/667) was obtained from Alex-Ekwueme Federal University Teaching Hospital Abakaliki. All participants were duly informed of the objectives of the study and the protocol for sample collection. Participation was voluntary.

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