

Prevalence and Antibiotics Susceptibility Pattern of Enteric Bacteria in Urine from Students of a Tertiary Institution in Port Harcourt, Rivers State, Nigeria

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ABSTRACT

Enteric bacterial infections of the urinary tract can lead to serious complications if not promptly diagnosed and adequately treated. This study investigated the prevalence and antibiotics susceptibility pattern of enteric bacteria in urine from students of a tertiary institution in Port Harcourt, Rivers State, Nigeria. A cross-sectional study design was employed, involving urine samples from three hundred and twenty (320) students, and processed aseptically following standard bacteriological techniques to screen the urine specimens for bacterial contaminants. The bacterial isolates were subjected to antimicrobial susceptibility testing using the Kirby–Bauer disc diffusion method and the reaction was interpreted according to the Clinical and Laboratory Standards Institute breakpoints. The enteric bacteria recovered from the urine samples included *Escherichia coli* (43.8%), *Serratia* spp. (18.8%), *Salmonella* spp. (18.8%), *Shigella* spp. (18.8%), *Klebsiella* spp. (15.6%), and *Proteus* spp. (12.5%). Overall, 87.5% of the students sampled yielded positive urine cultures for enteric bacteria, with bacteriuria more prevalent among female students (59.4%) than male students (28.1%). Antibiotic susceptibility testing revealed that all *Escherichia coli* isolates (100%) were susceptible to pefloxacin, whereas all *Salmonella* spp. isolates (100%) exhibited resistance to cefuroxime. These findings highlight a high burden of enteric bacterial contamination in urine among the student population and demonstrate notable variability in antibiotic susceptibility patterns. The study underscores the importance of regular surveillance of enteric bacteria in urine and advocates for routine antimicrobial susceptibility testing prior to treatment to ensure effective management and to mitigate the emergence of antibiotic resistance.

Keywords: Antibiotics Susceptibility, Prevalence, Enteric Bacteria, Urine, Tertiary Institution.

Introduction

Enteric bacteria are gram negative rod-shaped bacteria belonging to the family Enterobacteriaceae, and these bacteria are found in the gastrointestinal tract of humans and animals and are capable of causing complicated and uncomplicated Urinary Tract Infections known to affect millions of people annually and leading to serious health problems (Tajbakhsh *et al.*, 2015). Globally, seven million people visit the outpatient department; one million visits the emergency department and one hundred thousand patients visit the in-patient department annually, from symptomatic UTI (Foxman *et al.*, 2014). Enteric bacteria occur in both male and female but rarely in male students, when they occur, they come with severe implications to the health (Tajbakhsh *et al.*, 2015).

There are several factors that lead to enteric bacterial infections including bacteria, age, poor hygiene, sexual activity, weakened immune systems (diabetes), overpopulated living conditions and handling of animals and animal products (Hsueh *et al.*, 2011).

Enteric bacteria in male and female may clinically present with typical or atypical presentation. Typical presentation involves classic symptoms that are easily recognizable such as: Pain or burning during urination, frequent urination, Urgent urination, Cloudy or foul-smelling urine, Pelvic pain or pressure (in women) and Fever. Atypical presentation is frequently seen in aged (older) men and women and may have involuntary leakage of urine and confusion (Foxman *et al.*, 2014).

The UPEC strain that causes UTIs is different from the strain of facultative anaerobes inhabiting the gastrointestinal tract in that the UPEC strains has a mechanism that enables them to elude the host defense system and attach to the urinary tract by forming biofilms invading the urothelial cells. The *Streptococci* and *Staphylococci* are species amongst the members of enterobacteriaceae that also cause urinary tract infections (Foxman *et al.*, 2014).

Infections caused by enteric bacteria in the world today have and continuously cause a big economic impact because of high antibiotic use (Hsueh *et al.*, 2011). In Africa not much has been documented about the effects of the prevalence of enteric bacteria to the economy and healthcare systems. There is inadequate data concerning the occurrence of various enteric bacteria, how they affect quality of life of the population. For proper monitoring of the prevalence of enteric bacteria, such data is required from the public health system (Kurt *et al.*, 2010). Antimicrobial resistance (AMR) is a growing threat to global health, undermining the effectiveness of life-saving treatments and placing populations at heightened risk, whether from common infections or routine medical interventions. This new WHO report presents a global analysis of antibiotic resistance prevalence and trends, drawing on more than 23 million bacteriologically confirmed cases of bloodstream infections, urinary tract infections, gastrointestinal infections, and urogenital gonorrhoea (WHO, 2025).

Antibiotics resistance is becoming a worldwide cause of alarm, Nigeria is no exception. The resistance can arise naturally or due to misappropriation of the antibiotics. Misuse and overuse are the primary causes (WHO, 2023), in Nigeria antibiotics can be bought by men and women without prescription from trained practitioners. This is usually the chief cause of antibiotics misuse. A survey carried out across 12 countries by (WHO, 2015) showed that 64% of the public believes antibiotics can also be used to treat viral infections like common cold and influenza.

This basic gap in common knowledge has led to students buying and using antibiotics without knowing the consequences on antimicrobial resistance. Self-diagnosis is another reason for wrong use of antibiotics with the availability of the internet, increasing this problem.

About 35% of adults have at one point in their lives used the internet to diagnose an infection caused by enteric bacteria either for themselves or someone they know. Younger people, especially those with a college degree, have the highest chances of going online to diagnose the infections (Foxman *et al.*, 2014).

Enteric bacteria are amongst the most commonly occurring bacteria causing infections and second in antibiotic prescription in many Nigerian hospitals after respiratory infections. The most frequently cited etiology is *E. coli* which causes 90% of the UTIs in anatomically-normal unobstructed urinary tracts. Although the presence of enteric bacteria in males younger than 50 years is not common, the frequency increases afterwards. Treatment of enteric bacteria is easy if antibiotics are used rationally (Wallace *et al* 2020). Enteric bacteria in male and females are normally considered complicated with the consideration that it causes infection when ascended to the upper urinary tract.

Therefore, culture and analysis of antibiotic susceptibility patterns is more effective in the management of enteric bacteria in males and females because it aids in modification of treatment plans. The emergence of antibiotic resistance against commonly prescribed antibiotics in the treatment of enteric bacteria is an ongoing concern worldwide (Larsson & Flach, 2022).

In Nigeria, the prevalence of enteric bacteria is high with poor treatment outcomes due to prescription of low sensitive drugs coupled with inappropriate diagnosis. Most students are normally treated based on clinical judgment and urine culture done when students are refractory to antibiotic treatment, this is partly due to the perception that culture and sensitivity tests are expensive and time consuming by clinicians (Okonko *et al* 2018). Poor monitoring of antibiotic prescription use in the treatment of enteric bacteria is a major contributor to antibiotic resistance. If an attempt is not made to stop the progression of antimicrobial resistance, there is a greater risk for enteric bacteria related multi drug resistant (MDR) strains. Moreover, the university will be confronted with increased morbidity and mortality from enteric bacteria due to its complicated nature in male and female, therefore leading to higher costs of treatment to the patient and health care system (Barinua *et al*, 2023; Giami, *et al* 2025).

Globally, surveillance of antibiotics on enteric bacteria is reported to be uncoordinated. A situation that has led to fragmented or lack of accurate information on antibiotic resistance (WHO, 2021). Very few studies on enteric bacteria amongst students both male and female have been published (Wagenlehner *et al.* 2017). One of the reports has indicated that enteric bacteria are associated with UTIs in students, and are easily treated with antibiotics (Kayode *et al.*, 2019). While some male and female with enteric bacteria will not seek treatment leading to a higher risk of complications (Anuli *et al.*, 2016), majority of male and female self-diagnose and purchase over the counter cheap broad-spectrum antibiotics because of their poor health seeking behavior increasing the antibiotic resistant rate of the enteric bacteria hence the need for extensive study on male and female with enteric bacteria.

This study is aimed to assess the prevalence and antibiogram of enteric bacteria in urine from students of a tertiary institution in Port Harcourt, Rivers State, Nigeria. The data on prevalence and antibiogram of enteric bacteria will strengthen knowledge and provide further insight regard the health students of university students for proper health care management.

Materials and Methods

Study Area

The study was conducted in a tertiary institution in Port Harcourt, Rivers State. The university is situated at longitudes 6.9864° East and latitudes 4.8082° North and has a total area of 32.2 km² lying at an altitude of 10 meters above sea level. The study area was selected due to its high population of students.

Study Design

A cross sectional research design was utilized involving one-time sampling of urine specimen from the male and female students in hostel facilities within the University during the study period (July - September 2024).

Sample Collection

A sterile universal bottle was used to aseptically collect twenty milliliters of clean catch morning mid-stream urine from the male and female participants.

Proper labeling was done with the student's lab number and time of collection properly shown on the sample. Analysis of the sample was done in less than 6 hours after the sample is brought to the laboratory according to the procedure of Frank *et al.*, (2018).

Inclusion Criteria

- i. Any student who had not taken an antibiotic in the last two weeks.
- ii. All students who consented to participate.

Exclusion Criteria

- i. Any student with a week's history of hospital admission to rule out hospital-acquired infections.
- ii. Any student on or had taken antibiotics in the last two weeks.

Laboratory Procedures

Microbial Culture Method

This procedure used a sterile 4.0 mm wire loop to inoculate about 0.001 mL of the urine. Eosin Methylene Blue (EMB) agar and MacConkey agar medium were prepared according to the procedures below. Streaking on the media plates was done following the streak plate method to ensure single colony culturing. The cultured plates were incubated at 37°C for 24hrs and for 48hrs in cases where growth was not obtained.

Isolation of pure cultures

After incubation, the morphological characteristics of the colonies were identified and different colonies were picked out for isolation using the streak plate technique. The pure cultures were grown on Nutrient agar medium. Using a sterile wire loop, a colony was picked from the mixed culture plate and smeared on a freshly prepared Nutrient agar medium. The wire loop was sterilized by flaming in the Bunsen burner till it was red hot and allowed to cool; lines were streaked from the smear to one end of the medium to make the first quadrant. The same procedure was followed to get the second and third quadrant after which it was closed with a zig zag. These plates were incubated for 48hours after which pure cultures were visible on the lines of streak.

Identification of the pure isolates

The phenotypic characterization and identification of the pure isolates was based on Gram staining, motility test and biochemical tests such as methyl red, indole, Voges Proskauer, citrate, oxidase, catalase and sugar fermentation, carried out on the isolates (Cheesbrough, 2006).

Stocking of cultures

Agar slant was prepared by dissolving 28g of nutrient agar into 1000ml of distilled water, 5ml of this mixture was put into different bijou bottles and autoclaved at 121°C for 15 minutes after which it was kept in a slanted position and left to solidify. The isolated pure cultures were inoculated onto the surface of the agar and incubated for 24 hours after which they were refrigerated for preservation.

Preparation of 0.5M Mcfarland Turbidity Standard

About 1% v/v solution of Sulphuric acid was prepared by adding 1ml of concentrated sulphuric acid to 99ml of water and properly mixed. About 0.5g of dehydrated Barium Chloride ($\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$) was dissolved in 50ml of distilled water to prepare 1% w/v of Barium Chloride Solution. About 0.6ml of the Barium Chloride solution was added to 99.4ml of the sulphuric acid solution and properly mixed. A prepared turbid solution was transferred to a capped tube and kept in well-sealed container in the dark at room temperature (25-28°C) (Barinua et al., 2023).

Antibiotic susceptibility test

A sterile swab stick was dipped into the tube containing the bacterial suspension and its turbidity was equivalent to 0.5m McFarland turbidity. The swab stick was pressed against the tube above the fluid level to remove excess broth. The swab was used to streak over the entire plate surface evenly which contained already prepared Mueller- Hinton agar in three dimensions rotating the plate about 60°C each time. The agar plate was allowed to dry for 5 minutes then the antibiotic disk was impregnated to the agar using a sterile forcep on the surface of the inoculated plate 15mm away from the edge of the plate. Using the head of the sterile forcep the disk is slightly pressed down to ensure good contact with the agar.

After applying the disk, the plates were incubated in an inverted position at 35°C for 16 to 18 hours.

After incubation the test plates were examined to ensure confluence growth or near confluence. The diameter of each zone of inhibition was measured in ml using a ruler on the underside of the plate and recorded for reference purpose according to the Clinical and Laboratory Standards Institute breakpoints (CLSI, 2017).

Results

The gender and age distribution of students studied as presented in Table 1 shows that majority of the population sampled were female students representing 62.5% of the population sampled, with the male students accounting for 37.5% of the proportion studied. Overall, most of the students (53.1%) sampled were within the bracket of 19-23 years. This was also the same for the male and female age distribution, as students within the age bracket of 19 – 23 years accounted for the highest, representing 58.3% and 50% of the male and female students, respectively.

Table 1: Age categories of the male and female students' population studied

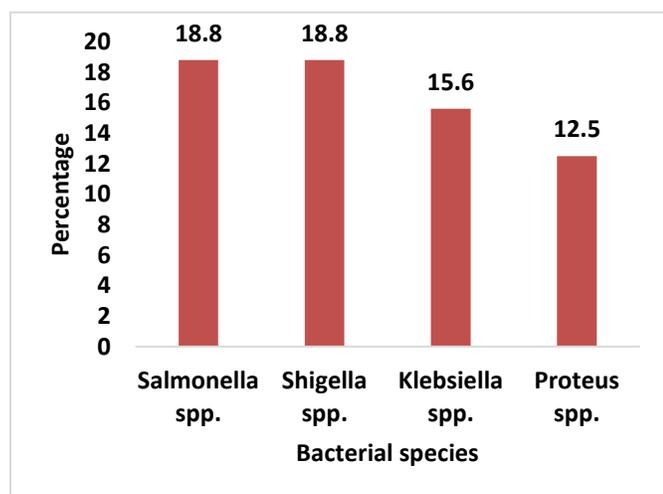
Age (years)	Male No. (%)	Female No. (%)	Overall No. (%)
≤18	-	10 (5)	10 (3.1)
19-23	70 (58.3)	100 (50)	170 (53.1)
24-26	40 (33.3)	60 (30)	100 (31.3)
27-30	10 (8.3)	30 (15)	40 (12.5)
Total	120 (37.5)	200 (62.5)	320 (100)

The demographic survey of urinary enteric bacteria in the study groups showed that, out of the 320 samples collected, 280 positive cases of bacteria were isolated (Table 2), representing an overall prevalence of 87.5%. The Gender-based incidence of enteric bacteriuria was noted to be higher in female (95%) than male (75%). The age specific bacterial contamination of urine showed that, apart from age groups ≤18, the highest incidence was noted among age bracket 27 – 30 years.

Figure 1 indicates that, enteric bacteria isolated included *E. coli* 14(43.8%), *Serratia* spp. 6(18.8%), *Salmonella* spp. 6(18.8%), *Shigella* spp. 6(18.8%), *Klebsiella* spp. 5(15.6%) and *Proteus* spp. 4(12.5%).

Table 2: Age specific incidence of bacteriuria amongst the students studied

Age Range (Years)/No.	Male = 12 No. (%)	Female = 20 No. (%)	Overall = 32 No. (%)
≤18 (1)	-	10 (100)	10 (100)
19 - 23 (17)	50 (71.4)	90 (90)	140 (82.4)
24 - 26 (10)	30 (75)	60 (100)	90 (90)
27 - 30 (4)	10 (100)	30 (100)	40 (100)
Total (320)	90 (75)	190 (95)	280 (87.5)

**Fig. 1: Prevalence of the bacterial species in study****Table 3: Distribution of Bacteria against Different Age Groups**

Age (Yr)	<i>E. coli</i>	<i>Klebsiella</i> spp	<i>Salmonella</i> spp	<i>Serratia</i> spp	<i>Shigella</i> spp	<i>Proteus</i> spp
≤18 (10)	10(100)	10(100)	10(100)	-	-	-
19-23 (170)	80(47.1)	20(11.8)	20(11.8)	10(5.88)	40(23.5)	20(11.8)
24-26 (100)	30(30)	-	10(10)	30(30)	20(20)	-
27-30 (40)	20(50)	20(50)	20(50)	20(50)	-	20(50)

Salmonella spp. showed sensitivity to Pefloxacin 6(100%), Ofloxacin 6(100%), Gentamycin 6(100%), Ciprofloxacin 6(100%), Ceftriaxone 6(100%), Streptomycin 6(100%) and Ceporex 6(100%). High resistance to Cefuroxime 6(100%), Ceftazidime 4(66.7%) and Augmentin 3(50%) was recorded.

Klebsiella spp. isolated were more susceptible to Pefloxacin 5(100%), Ofloxacin 5(100%), Gentamycin 5(100%), Ciprofloxacin 5(100%), Streptomycin

The distribution of the different bacterial species in the age groups studied showed that apart from the group of less than or equal to 18 years, the occurrence of each of the bacterial species was highest between age brackets 27 -30, as 50% of the population had the presence of the different enteric bacteria, excluding *Shigella* spp. that was not isolated in this age group (Table 3).

Antibiotics susceptibility pattern of the identified enteric bacteria showed that Pefloxacin is the most effective drug as it was active against all (100%) of the different enteric bacteria recovered from the urine specimen (Table 4). It also indicated in Table 4 showed that 14 (100%) of *E. coli* displayed *in vitro* susceptibility to Pefloxacin, Ofloxacin, Streptomycin and Ciprofloxacin, with varying number of (%) isolates showing susceptibility to the other drugs such as Gentamycin 13(92.9%), Ceftazidime 12(85.7%), Augmentin 12(85.7%) and Ceporex 11(78.6%) as shown in the Table below.

Serratia spp. showed high sensitivity to Pefloxacin 6(100%), Ofloxacin 6(100%), Gentamycin 6(100%), Ciprofloxacin 6(100%), Streptomycin 6(100%), Ceftazidime 5(83.3%) and Ceftriaxone 5(83.3%). High level of resistance to Cefuroxime 5(83.3%) also noted.

5(100%), Ceporex 5(100%), Augmentin 5(100%) and Ceftazidime 4(75%). High resistance to Cefuroxime 3(75%) was noted in the study.

Proteus spp. showed high sensitivity to Pefloxacin 4(100%), Ofloxacin 4(100%), Ceftriaxone 4(100%), Ciprofloxacin 4(100%), Gentamycin 4(100%), Streptomycin 4(100%) and Cefuroxime 3(75%). High resistance to Ceporex 3(75%), Augmentin 3(75%) and Ceftazidime 3(75%) was reported in Table 4.

Table 4: Antibiogram of the enteric bacteria recovered from the urine specimen

Antibiotics	<i>Escherichia coli</i>		<i>Salmonella spp.</i>		<i>Shigella spp.</i>		<i>Serratia spp.</i>		<i>Klebsiella spp.</i>		<i>Proteus spp.</i>	
	R	S	R	S	R	S	R	S	R	S	R	S
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Augmentin	2(14.3%)	12(85.7%)	3(50%)	3(50%)	1(16.7%)	5(83.3%)	-	5(100%)	-	5(100%)	3(75%)	1(25%)
Pefloxacin	-	14(100%)	-	6(100%)	-	6(100%)	-	5(100%)	-	5(100%)	-	4(100%)
Ceftazidime	2(14.3%)	12(85.7%)	2(33.3%)	4(66.7%)	-	6(100%)	1(25%)	4(75%)	1(25%)	4(75%)	3(75%)	1(25%)
Gentamycin	1(7.1%)	13(92.9%)	-	6(100%)	-	6(100%)	-	5(100%)	-	5(100%)	-	4(100%)
Ciprofloxacin	-	14(100%)	-	6(100%)	1(16.7%)	5(83.3%)	-	5(100%)	-	5(100%)	-	4(100%)
Ceporex	3(21.4%)	11(78.6%)	-	6(100%)	2(33.3%)	4(66.7%)	-	5(100%)	-	5(100%)	3(75%)	1(25%)
Ceftriaxone	2(14.3%)	12(85.7%)	-	6(100%)	-	6(100%)	-	5(100%)	-	5(100%)	-	4(100%)
Streptomycin	-	14(100%)	-	6(100%)	-	6(100%)	-	5(100%)	-	5(100%)	-	4(100%)
Ofloxacin	-	14(100%)	-	6(100%)	-	6(100%)	-	5(100%)	-	5(100%)	-	4(100%)
Cefuroxime	12(85.7%)	2(14.3%)	6(100%)	-	4(66.7%)	2(33.3%)	4(75%)	1(25%)	4(75%)	1(25%)	-	4 (100)

Key: R –Resistance; S – Susceptible; n – number of isolates

Discussion

The findings of this study revealed that the overall occurrence rate of enteric bacteria among the students was 87.5%, which was comparatively corresponding to the occurrence rate documented from other studies within the country and other parts of the world, including Egypt, 52.2%, by El-Nagar *et al.* (2015) and Nepal, 54.3% as reported by Kumar *et al.* (2014). Nevertheless, a significant occurrence (75%) was documented in Niger state, Nigeria by Anne *et al.*, (2012).

The enteric bacteria isolated in the cause of the study were *Escherichia coli*, *Salmonella* spp, *Shigella* spp, *Serratia* spp, *Klebsiella* spp and *Proteus* spp. *E. coli* is a normal microbial flora of the gastrointestinal tract and may not cause harm to humans. These bacteria act as opportunistic bacteria causing urinary tract infections presented in the urine and is transmitted through fecal-oral mode of transmission, poor hygiene practices, sexual activities, urinary tract abnormalities and urinary catheters (Okonko *et al* 2018).

Furthermore, the findings of the study revealed that enteric bacteria were more prevalent in females compared to male students. The anatomical differences between males and females, such as the shorter female urethra and its proximity to the anus, contribute to the disparity by facilitating the entry of enteric bacteria into the urinary tract.

In the study, *E. coli* constituted the predominant enteric bacteria in the study population, accounting for 43.8%. Comparable findings were reported in different regions of Nigeria, including 50% from Afikpo, Ebonyi State as reported by Onuoha *et al.* (2014), 56% from Zaria, Kaduna State (Giwa *et al.*, 2018) and 42% from Ibadan, Oyo State (Okonko *et al.*, 2009). Studies conducted in various parts of the globe also documented consistent outcomes corroborating these findings, revealing the prevalence of *E. coli* from a study in Eastern Ethiopia as 45.2% (Ejerssa *et al.*, 2021), and 67.6% from India (Sharma *et al.* (2016). The dominance of *E. coli* among the study population may not be bewildering because intestinal commensals play significant role in prevalence of enteric bacteria due to their proximity to the genitourinary area anatomically.

Moreover, *E. coli* is also considered uropathogenic enteric bacteria due to specific virulence factors (P-fimbria and S-fimbria adhesions) that enable colonization and invasion of the urinary epithelium (Worku *et al.*, 2021).

However, in this study, while *E. coli* remained the most prevalent enteric bacteria isolated, *Salmonella* spp., *Shigella* spp., and *Serratia* spp. were the second most prevalent enteric bacteria recovered, followed by *Klebsiella* spp. *Proteus* spp. was however the least enteric bacteria in the study. These results indicate a changing pattern of prevalence of uropathogenic enteric bacteria, suggesting that other enteric bacteria are becoming increasingly important and attributable to other health conditions (Hanson *et al.*, 2023; Nwankwo *et al.*, 2025).

Poor hygiene practices that bring these enteric bacteria in contact with the vulva or genitalia and penis can cause urinary tract infections (UTIs). These happens when bacteria enter the urethra or urethral meatus (opening in the penis that allows drainage of urine and semen) during sex, unwashed hands touching the genitalia and penis, use of dirty toilet facilities in hostels, and toilet water back splash (Chuks Dike *et al.*, 2023; Gupta *et al.*, 2014).

In this study, enteric bacteria isolated from urine specimens exhibited a high level of susceptibility to fluoroquinolone antibiotics, with pefloxacin showing 100% activity against all isolates. This pattern of high fluoroquinolone efficacy aligns with findings reported in Nigerian clinical settings, where second-generation fluoroquinolones such as ciprofloxacin and ofloxacin remain among the most effective agents against uropathogenic Gram-negative bacteria (Akinpelu *et al.*, 2024). The complete susceptibility of *E. coli* to pefloxacin, ofloxacin, ciprofloxacin, and streptomycin in the present work is consistent with other regional studies that documented strong fluoroquinolone activity against *E. coli* and other uropathogens (Akinpelu *et al.*, 2024; Jombo *et al.*, 2011).

While fluoroquinolone susceptibility was high, variability in response to β -lactam antibiotics was evident across organisms. For example, *E. coli* in this study showed moderate susceptibility to gentamicin and ceftazidime but lower susceptibility to augmentin and ceporex.

This mirrors broader regional patterns of rising resistance to β -lactam agents, including amoxicillin-clavulanate, reported in Nigerian (Adeleye et al., 2024). Such resistance trends are frequently attributed to widespread use of broad-spectrum β -lactams and the proliferation of extended-spectrum β -lactamase (ESBL) producing strains (Umar et al, 2023).

The high level of resistance to cefuroxime observed among *Serratia*, *Salmonella*, and *Klebsiella* spp. is also in agreement with literature indicating diminished susceptibility of many enteric bacteria to second-generation cephalosporins in Nigeria (Akinpelu et al., 2024; Jombo et al., 2011). Increased resistance to drugs like cefuroxime and augmentin may reflect ongoing selection pressure from empirical use of these agents without culture guidance, a pattern highlighted in current antimicrobial surveillance reports (Adeleye et al, 2024).

Similarly, *Proteus* spp. in the current study were highly susceptible to fluoroquinolones and gentamicin but showed marked resistance to some β -lactam antibiotics such as augmentin and ceftazidime. Comparable susceptibility profiles have been described in other Nigerian studies where *Proteus* isolates exhibited resistance to multiple non-fluoroquinolone agents (Jombo et al 2011).

Overall, these results reinforce the importance of continual antimicrobial surveillance to detect evolving resistance patterns among enteric uropathogens. The similarity of our findings with other Nigerian and sub-Saharan studies suggests that fluoroquinolones, particularly pefloxacin, remain viable first-line agents for empiric therapy in uncomplicated UTIs (Akinpelu et al., 2024). However, the observed resistance to β -lactams highlights the need for culture-guided therapy and strengthened antimicrobial stewardship to limit further escalation of resistance.

Conclusion

This study demonstrated a high prevalence of enteric bacteria among the University students residing in hostels indicating significant exposure to enteric pathogens within the hostel environment. *Escherichia coli* was the predominant isolate, while *Proteus* spp. occurred least, highlighting the dominance of fecal-associated bacteria in communal living settings.

The highest prevalence was observed among students aged 19–23 years in both sexes, suggesting that younger hostel residents may be at increased risk of exposure, likely due to behavioral and environmental factors associated with shared facilities. Antibiotic susceptibility testing revealed marked variability in bacterial response to antimicrobial agents. Fluoroquinolones and aminoglycosides—particularly pefloxacin, ciprofloxacin, ofloxacin, gentamicin, and streptomycin—were the most effective against the isolated enteric bacteria, whereas β -lactam antibiotics such as cefuroxime and augmentin showed reduced effectiveness. These findings indicate the continued usefulness of fluoroquinolones for the management of enteric bacterial infections in this setting, while also highlighting emerging resistance to commonly used β -lactam antibiotics. Overall, the study underscores the need for improved sanitation and hygiene practices in university hostels, routine antimicrobial susceptibility testing, and strengthened antimicrobial stewardship to limit the spread of enteric bacteria and for the effective infection prevention and control strategies to curb the development of antibiotic resistance.

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