

# Prevalence of Urinary Tract Infection and Antibiotic Susceptibility Pattern of Isolates Amongst Female Students of Two Nigerian Universities

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## Citation

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## Abstract

Background: Urinary tract infection (UTI) is a serious infection in humans, occurring more in females of child bearing age. Antibiotic resistance to isolates from UTI is increasing.

Aim: This study aimed at determining the prevalence of UTI amongst female students of two Nigerian universities, associated risk factors, frequency of isolates, and antibiotic susceptibility pattern of isolates.

Materials and Methods: This cross-sectional study investigated 200 randomly selected female students of University of Nigeria Enugu Campus and Enugu State University of Science and Technology, Nigeria, with signs and symptoms of UTI, for UTI and antibiotic susceptibility pattern of isolates. The students were aged 16-30 years. The study was conducted between April and October, 2017. Ethical approval and informed consents were obtained. Clean-catch mid-stream urine samples of the students were collected. Culture, urinalysis, standard biochemical tests and antibiotic susceptibility tests was performed using standard microbiological methods.

Results: Out of the 200 female students investigated for UTI, 80 (40%) were positive. The age group 26-30 years had the highest prevalence for UTI. Out of 80 isolates obtained, coagulase negative Staphylococcus recorded 33 (41.3%) followed by Escherichia coli 24 (30.0%), Staphylococcus aureus 11 (13.8%), Candida spp 6 (7.5%), Enterococcus spp 3 (3.8%), Klebsiella spp 2 (2.5%) and Proteus spp 1 (1.3%). Gram positive isolates showed highest susceptibility to levofloxacin 87.2% followed by ciprofloxacin 83.0%. Gram negative isolates showed highest susceptibility to ciprofloxacin 74.1% followed by streptomycin 70.4%.

Conclusion: Levofloxacin for Gram positive isolates and ciprofloxacin for Gram negative isolates, were the most effective drugs.

## INTRODUCTION

Urinary tract infection (UTI) is one of the most common infections of humans in Nigeria and this infection usually needs urgent treatment. Urinary tract infection is a significant health problem, both in the community and hospital-based settings. It is a serious health problem affecting millions of people each year (1).

Urinary tract infection could be defined as the persistent presence of actively multiplying microorganisms in the urinary tract. It is an infection with more than 100,000 organisms per milliliter of midstream urine sample (2). The urinary tract comprises of the kidneys, ureters, bladder and

urethra. When infection occurs in the kidneys, it is called pyelonephritis, in the ureter (uretitis), in the bladder (cystitis), in the urethra (urethrititis).

Microorganisms including bacteria, fungi, parasites and viruses can cause UTI but bacteria are the major cause of most UTI's. Many previous studies have shown the bacteria E. coli as the commonest or most prevalent isolates in UTI (3,4,5,6). Escherichia coli has also been documented as the most frequent isolate in UTI in female patients (7,8), in female students (9,10) and in pregnant women (11,12). However, some studies have shown Staphylococcus species as leading cause of bacteriuria (13) and UTI (14).

*Staphylococcus aureus* have also been shown to be the highest cause of UTI in a study (15).

Urinary tract infection has been reported in all ages and in both sexes. However, women are more susceptible than men due to short urethra, absence of prostatic secretion, pregnancy and easy contamination of the urinary tract with fecal flora (16). The commonest mode of infection is the ascending route, through which organisms of the bowel flora contaminate the urethra, ascends to the bladder and migrate to the kidney or prostate (11). Females are more susceptible to colonization with enteric bacteria due to shortness of their urethra. The close proximity of the urethral orifice to the rectum, which is in direct contact with perineal microbes, also makes the females to be more susceptible to UTI. In males, the sterility of the proximal two-thirds of the urethra, its longer length and the bactericidal effect of prostatic secretion constitute an excellent immunological defense against bacterial infection (11).

UTI's are the most frequent bacterial infection in women. They occur most frequently between ages of 16 and 35 years with 10% of women getting an infection at some point in their lives. Recurrences are common, with nearly half of people getting a second infection within a year. UTI's occur 4 times more frequently in females than in males (6). The main factors predisposing married women to bacteriuria are pregnancy and sexual intercourse (17). UTI's are common complications of pregnancy and it may manifest as asymptomatic bacteriuria or symptomatic bacteriuria (12). Using diaphragm can also lead to UTI's because diaphragms push against the urethra and make it harder to completely empty the bladder and the urine that stays in the bladders is more likely to grow bacteria and cause infections (18).

Previous studies have shown different prevalence rates for UTI in females of reproductive age group; 38.6% from Lahore (10), 20.4% from TamilNadu (19), in female patients attending hospitals for UTI in Indore India 61% (8) and in Lucknow 45.32% (7), in pregnant women at Awka, South Eastern Nigeria 54% (11) and at Gondar, North West Ethiopia 12% (12). Amongst female University students, prevalence of UTI have also been reported; 65% from University of Ado Ekiti, Nigeria (9), 90.1% (192/213) from University of Agriculture Benue State, Nigeria (15).

Urinary tract infection is significant when colony counts of bacteria on culture is  $>10^5$  CFU/ml of urine examined. Dirty toilet system shared by students, sharing of underwear's and

buckets by some students, low personal hygiene, sex, pregnancy, use of diaphragm and other birth control measures, could predispose students to UTI. Frequent "over the counter" purchase of antibiotics at every suspicion of UTI by students could result to antibiotic resistance. Untreated UTI could result to serious complications such as pyelonephritis, kidney failure, urosepsis, death (20), adverse obstetric outcomes such as premature delivery, low-birth weight babies and higher fetal mortality rates (21). This study therefore aimed at investigating urinary tract infection amongst students of two Nigerian universities, with the objectives of determining the prevalence of UTI amongst them, associated risk factors, frequency of the urine isolates and antibiotic susceptibility pattern of the isolates to commonly used antibiotics in the study area Enugu State Nigeria.

## **MATERIALS AND METHODS**

**Study design:** This study was a cross-sectional study

### **Study Area**

This study was conducted amongst students of University of Nigeria Enugu Campus (UNEC) and students of Enugu State University of Science and Technology (ESUT) both in Enugu State, South East Nigeria, West Africa.

### **Study Population**

The Study population consisted of 200 female students residing in the hostel accommodations of University of Nigeria Enugu Campus (UNEC) and Enugu State University of Science and technology (ESUT) (100 female students from each of the two schools) with two or more signs and symptoms of urinary tract infection (UTI), who gave their informed consents and who had not been on any antibiotics two weeks before and during sample collection.

### **Ethical Consideration**

Ethical clearance (approval) was obtained for the study from the Health research and ethics Committee of University of Nigeria Teaching Hospital (UNTH) Ituku-Ozalla while informed consents were obtained from the participants before commencement of sample collection.

### **Sampling Methods**

A total of 100 female students residing in the hostel accommodations of UNEC and 100 female students of ESUT (totaling 200 students) with 2 or more signs and

symptoms of urinary tract infection (frequency in urination, urgency in urination, dysuria, fever, etcetera) and who gave their informed consent for inclusion in the study, were randomly selected and were investigated for UTI after Ethical Clearance (approval) was obtained from the Health Research and Ethics Committee of UNTH Ituku-Ozalla. The students were aged 16-30 years. The study was conducted from April to October, 2017. Biodata/Socio-demographic information and clinical history of the participants were obtained before sample collection using structured questionnaires. Students on antibiotic therapy two weeks before and during sample collection were excluded.

#### Sample Collection

Clean-catch early morning mid-stream urine sample was collected by each participant into sterile screw capped urine bottle containing boric acid crystals. Each participant was enlightened on the purpose and importance of the study. Informed consent was obtained from each participant who was also taught how to collect her urine sample before sample collection by the next morning. The urine samples were sent for laboratory investigations within one hour of collection.

#### Laboratory Investigations

The laboratory investigations were according to methods of Cheesbrough (20).

#### Urine Culture

A sterile calibrated wire loop that holds 0.002ml of urine was used to culture each urine sample onto blood agar plate, Cystine lactose electrolyte Deficiency (CLED) agar plate and Sabouraud dextrose agar (SDA) tube slant respectively. The blood agar plates and CLED agar plates were incubated at 37°C for 24 hours for possible isolation of bacterial colonies while the SDA tubes were incubated at 37°C for 48 hours for possible isolation of Candida species.

#### Urinalysis

Each urine sample was examined macroscopically for their colour and turbidity which was recorded. Urine chemistry was done on each sample using the dipstick method. Each urine sample was poured into a clean test tube and one strip of Combi 9TM was dipped into the urine sample and observed for any colour change. The presence of glucose, protein, blood, bilirubin, nitrate, leucocyte esterase, ketones, ascorbic acid, etcetera, were noted. Microscopic examination

was done by first centrifuging the urine samples and examination of urine deposits of each sample noting the presence of any abnormal constituents such as white blood cells (WBC's), red blood cells (RBC's), casts, yeast cells, crystals, epithelial cells, parasites, etcetera. Pyuria was regarded as significant when pus cells were >10 WBC's/HPF (20).

#### Macroscopic examination of plates and tube cultures

After incubation, colonies of growth observed on each culture plate were examined macroscopically for their morphological characteristics and number of colonies for evidence of significant bacteriuria. Any growths observed on SDA tube slants were also examined macroscopically.

#### Microscopic examination of colonies of growth

Colonies of growth on plates with pure cultures which had significant bacteriuria (> 10<sup>5</sup>CFU/ml of urine) were Gram stained and examined microscopically. The pure colonies were sub-cultured onto nutrient agar slants and incubated at 37°C for 24 hours and were used for further identification tests.

#### Biochemical Tests

Gram reaction, catalase test, coagulase test, oxidase test, indole, methyl-red, Voges-proskaur and citrate utilization tests (IMViC tests), sugar fermentation tests, were performed on the sub-

cultures of growths with significant bacteriuria for further identification.

#### Antibiotic susceptibility tests

Antibiotic susceptibility tests were carried out on confirmed bacterial isolates from plates with significant bacteriuria using the Kirby-bauer disk diffusion technique (22). Gram positive drug discs used were ciprofloxacin (CPX) 10mcg, norfloxacin (NB) 10mcg, gentamycin (CN) 10mcg, Amoxil (AML) 20mcg, streptomycin (S) 30mcg, Rifampicin (RD) 20mcg, Erythromycin (E) 30mcg, Chloramphenicol (CH) 30mcg, Ampiclox (APX) 20mcg, Levofloxacin (LEV) 20mcg. Gram negative drug discs used were ofloxacin (OFX) 10mcg, Peflacin (PEF) 10mcg, ciprofloxacin (CPX) 10mcg, augmentin (AU) 30mcg, gentamycin (CN) 10mcg, streptomycin (S) 30mcg, Ceporex (CEP) 10cmg, Nalidixic acid (NA) 30mcg, septrin (SXT) 30mcg, ampicillin (PN) 30mcg (OPTU DISCS Nigeria Limited).

# Prevalence of Urinary Tract Infection and Antibiotic Susceptibility Pattern of Isolates Amongst Female Students of Two Nigerian Universities

## Statistical Analysis

All data generated from this study were subjected to statistical analysis using one-way analysis of variance (ANOVA) and Fisher's exact test. P values < 0.05 were considered as significant.

## RESULTS

A total of 200 female students with signs and symptoms of UTI comprising of 100 female students from UNEC and 100 female students from ESUT were investigated for UTI (Table 1).

**Table 1**

Age distribution of female students sampled from UNEC and ESUT

n=200					
Age group (years)	UNEC students sampled	%	ESUT students sampled	%	Total %
16-20	53	53.0	47	47.0	100
21-25	43	46.2	50	53.8	93
26-30	4	57.1	3	42.9	7
Total	100	50.0	100	50.0	200

Out of the 100 female students from UNEC examined for UTI, 38 (38.0%) were positive while out of the 100 female students from ESUT examined for UTI, 42 (42.0%) were positive. Overall, of the 200 students from both schools (UNEC and ESUT) examined for UTI, 80 (40.0%) were positive. The difference in the number of positive cases for UTI between female students of UNEC and female students of ESUT studied was not statistically significant ( $p > 0.05$ ), P value = 0.6651 using fishers exact test. The age group 26-30 years had the highest prevalence for UTI in each of the schools studied 50.0% for UNEC, 66.7% for ESUT and 57.1% for both schools when combined 57.1% (Table 2).

**Table 2**

Distribution of positive cases for UTI amongst female students of UNEC and ESUT combined

n=100 UNEC				n=100 ESUT				n=200 UNTH + ESUT			
Age group (years)	No of females sampled	No positive for UTI	%	Age group (years)	No of females sampled	No positive for UTI	%	Age group (years)	No of females sampled	No positive for UTI	%
16-20	53	19	35.8	16-20	47	16	34.0	16-20	100	35	35.0
21-25	43	17	39.5	21-25	50	24	48.0	21-25	93	41	43.0
26-30	4	2	50.0	26-30	3	2	66.7	26-30	7	4	57.1
Total	100	38	38.0	Total	100	42	42.0	Total	200	80	40.0

Out of the 80 isolates from UTI from both UNEC and ESUT female students combined, coagulase negative

Staphylococcus (CoNS) were the most frequently isolated organisms 33 (41.3%) followed by Escherichia coli 24 (30.0), Staphylococcus aureus 11 (13.8%), Candida spp 6 (7.5%), Enterococcus spp 3 (3.8%), Klebsiella spp 2 (2.5%) and Proteus spp 1 (1.3%). Difference between the number of the different organisms isolated was statistically significant ( $p < 0.05$ ), P value = 0.0073) using one-way ANOVA (Table 3).

**Table 3**

Frequency of isolation of microorganisms from urine samples of female students of UNEC and ESUT combined

n = 80		
Organisms isolated	Number isolated	Percentage (%)
CoNS	33	41.3
Escherichia coli	24	30.0
Staphylococcus aureus	11	13.8
Candida spp	6	7.5
Enterococcus spp	3	3.8
Klebsiella spp	2	2.5
Proteus spp	1	1.3
Total	80	100

Risk factors studied to determine if there was any association between them and UTI showed that there was an association between four of the risk factors and UTI ( $p < 0.05$ ) for UNEC students namely; staying in crowded hostels  $p = 0.0001$ , staying in hostel with poor sanitation  $p = 0.0025$ , having frequent sexual intercourse  $p = 0.0176$  and wearing tight with underwear's  $p = 0.0066$ . There was however no association between use of clean toilet, wiping from back to front after using the toilet and UTI ( $p > 0.05$ ) respectively. There was no association between the six risk factors studied and UTI in female students of ESUT studied ( $p > 0.05$ ) (Table 4).

**Table 4**

Risk factor investigated for any association between them and UTI in the female students of UNEC and ESUT studied

Variables	UNEC FEMALE STUDENTS				Significance and p value	ESUT FEMALE STUDENTS				Significance and p value
	Yes	no positive for UTI	No	no positive for UTI		Yes	no positive for UTI	No	no positive for UTI	
Staying in crowded hostels	45	25	55	9	( $p < 0.05$ ), $p = 0.0001$	25	8	75	32	( $p > 0.05$ ), $p = 0.4800$
Good hostel sanitation	24	2	76	32	( $p < 0.05$ ), $p = 0.0025$	80	34	20	6	( $p > 0.05$ ), $p = 0.4447$
If toilet in use is clean	27	7	73	27	( $p < 0.05$ ), $p = 0.3491$	68	29	32	11	( $p > 0.05$ ), $p = 0.5141$
Frequent sexual intercourse	28	15	72	19	( $p < 0.05$ ), $p = 0.0176$	23	12	77	28	( $p > 0.05$ ), $p = 0.2263$
Wiping from back to front after using the toilet	23	9	77	25	( $p < 0.05$ ), $p = 0.6190$	19	10	81	30	( $p > 0.05$ ), $p = 0.2981$
Wearing tight fitting underwear	15	10	85	24	( $p < 0.05$ ), $p = 0.0066$	18	5	82	35	( $p > 0.05$ ), $p = 0.2956$

Antibiotic susceptibility tests carried out revealed that the

# Prevalence of Urinary Tract Infection and Antibiotic Susceptibility Pattern of Isolates Amongst Female Students of Two Nigerian Universities

Gram-positive isolates showed overall highest susceptibility to levofloxacin 87.2% followed by ciprofloxacin 83.0%, rifampicin 72.3%, streptomycin 60% while they showed least susceptibility to norfloxacin 40.4% (Table 5).

**Table 5**

Antibiotic susceptibility pattern of Gram-positive bacteria isolated from UTI in the female students of UNEC and ESUT (combined) studied

Bacteria Isolated	No Isolated	Antibiotics Tested									
		CPX	NB	GN	AML	S	RD	E	CH	APX	LEV
Staph aureus	11	10(90.9)	6(54.5)	6(54.5)	4(36.4)	6(54.5)	7(63.4)	4(36.4)	2(18.2)	2(18.2)	10(90.9)
CoNS	33	26(78.8)	13(39.9)	18(54.5)	18(54.5)	21(63.6)	25(75.8)	18(54.5)	16(48.5)	16(48.5)	28(84.8)
Enterococcus spp	3	3(100)	0(0)	2(66.7)	3(33.3)	1(100)	2(66.7)	2(66.7)	3(100)	3(100)	3(100)
Total	47	39(83.0)	19(40.4)	26(55.3)	25(53.2)	28(60)	34(72.3)	24(51.1)	21(44.7)	21(44.7)	41(87.2)

Key: CPX = Ciprofloxacin, NB = Norfloxacin, GN = Gentamycin, AML = Amoxicillin, S = Streptomycin, RD = Rifampicin, E = Erythromycin, CH = Chloramphenicol, APX = Ampicillin, LEV = Levofloxacin

Gram negative isolates showed overall highest susceptibility also to ciprofloxacin 74.1% followed by streptomycin 70.4%, gentamycin 55.6% with least susceptibility to ampicillin 22.2% (Table 6). Staphylococcus aureus isolates, Escherichia coli isolates and the lone Proteus spp isolates showed multidrug resistance to the drugs tested (4 drugs by S.aureus, 6 drugs by E.coli and 7 drugs by Proteus spp) (Table 5 and 6).

**Table 6**

Antibiotic susceptibility pattern of Gram-negative bacteria isolated from UTI in the female students of UNEC and ESUT (combined) studied

Bacteria Isolated	No Isolated	Antibiotics tested									
		OFX	PEF	CPX	AU	GN	S	CEP	NA	SXT	PN
E. coli	24	10(41.7)	12(50)	19(76.1)	10(41.7)	14(58.3)	18(75)	8(33.3)	6(25)	8(33.3)	5(20.8)
Klebsiella spp	2	2(100)	0(0)	1(50)	1(50)	1(50)	1(50)	1(50)	0(0)	1(50)	1(50)
Proteus spp	1	1(100)	0(0)	0(0)	0(0)	0(0)	0(0)	1(100)	1(100)	0(0)	0(0)
Total	27	13(48.1)	12(44.4)	20(74.1)	11(40.7)	15(55.6)	19(70.4)	10(37.0)	7(26.0)	9(33.3)	6(22.2)

Key: OFX = Ofloxacin, PEF = Pefloxacin, CPX = Ciprofloxacin, AU = Augmentin, GN = Gentamycin, S = Streptomycin, CEP = Ceporex, NA = Nalidixic acid, SXT = Septin, PN = Ampicillin

## DISCUSSION

The result of the present study showed that out of 100 female students of UNEC investigated for UTI, 38 (38%) were positive while out of 100 female students of ESUT investigated for UTI, 42 (42%) were positive. Overall, of the 200 female students investigated for UTI from both schools (UNEC and ESUT) studied, 80 (40%) were positive (Table 2). This prevalence for UTI obtained from UNEC and ESUT individually and when combined, are lower than the 65% prevalence for UTI obtained by Ojo and Anibijuwon (9) amongst students of University of Ado Ekiti Nigeria that they studied for UTI. Staying in crowded hostels, poor sanitary conditions in student's hostels especially in their toilets, poor personal hygiene of the students are risk factors for UTI which is prevalent in most government Universities in Nigeria, and these may be obtained more in the University

of Ado Ekiti Nigeria than in UNEC and ESUT, leading to the higher prevalence of UTI in University of Ado Ekiti, Nigeria.

The age group 26-30 years in this study had the highest prevalence for UTI in each of the two schools studied; 50% for UNEC, 66.7% for ESUT and 57.1% for both schools when combined (Table 2). This age group comprises of adults most of whom may be married and indulge in sexual intercourse while some may be single or engaged to be married but may be having sexual intercourse. The main factors predisposing married women to bacteriuria are pregnancy and sexual intercourse (17).

Of the 80 isolates from UTI from female students of both UNEC and ESUT, CoNS were the most frequent isolates 33 (41.3%) followed by Escherichia coli 24 (30.0%), Staphylococcus aureus 11 (13.8%), Candida spp 6 (7.5%), Enterococcus spp 3 (3.8%), Klebsiella spp 2 (2.5%) and Proteus spp 1 (1.3%) (Table 3). This result is similar to the result of Onyebueke et al, (14) in which Staphylococcus spp were the most frequent isolates 29% in their UTI study followed by Escherichia coli 23.5%, other isolates followed and the result of Bolaji et al, (13) in which Staphylococcus spp was the leading cause of bacteriuria in their study 25.4% followed by Escherichia coli 16.8%, other isolates followed. The result of the present study which showed CoNS as the most frequent isolates followed by E. coli is not in agreement with the result of Ojo and Anibijuwon (9) on UTI in female student of Ado Ekiti, Nigeria in which E. coli was their most frequent isolates 32.76%. Many previous studies on UTI have shown E.coli as the most frequent isolates in UTI general (3,4,5,6), in female patients (7,8), in female students of universities (9,10) and in pregnant women (11,12).

Risk factors investigated for any association with UTI in this study showed that staying in crowded hostel, poor hostel sanitation, frequent sexual intercourse and wearing of tight fitting underwear had association with UTI ( $P < 0.05$ ) in UNEC students but use of clean toilet and wiping from back to front after using the toilet did not show association with UTI. The 6 risk factors investigated showed no association with UTI amongst ESUT students studied (Table 4). Factors including improper cleaning of the perineum, the use of napkins and sanitary towel together with pregnancy and sexual intercourse contribute to the higher incidence of UTI's in various women (11).

Antibiotic susceptibility test results revealed that Gram-positive isolates showed highest susceptibility to levofloxacin 87.2% followed by ciprofloxacin 83.0%, rifampicin 72.3%, streptomycin 60% and least susceptibility to norfloxacin 40.4% (Table 5). Gram-negative isolates showed highest susceptibility to ciprofloxacin 74.1% followed by streptomycin 70.4%, gentamycin 55.6% with least susceptibility shown to ampicillin 22.2% (Table 6). Thus Levofloxacin followed by ciprofloxacin (for Gram positive isolates) and ciprofloxacin (for Gram negative isolates), are the drugs of choice for the treatment of UTI in these students studied.

Staphylococcus aureus isolates in the present study showed highest susceptibility to ciprofloxacin and levofloxacin (90.9%) each followed by rifampicin 63.4%, gentamycin, streptomycin and norfloxacin (54.5%) each while they showed very low susceptibility to amoxil and erythromycin (36.4%) each, chloramphenicol and ampiclox (18.2%) each (multi-drug resistance). This result is not in agreement with the result of the study of Ferede et al, (12) in which S. aureus isolates in their work showed highest susceptibility to gentamycin and ampiclox (amoxicillin + clavulanic) (100%) each followed by ciprofloxacin 75%, norfloxacin, amoxyl and chloramphenicol (50%) each.

The result of the present study in which S. aureus isolates showed susceptibility to levofloxacin 90.9% and streptomycin 54.5% is in agreement with the work of Amaeze et al, (3) in which S. aureus isolates showed susceptibility to levofloxacin 67.68%, Streptomycin 54.1%. Staphylococcus aureus isolates in the work of Amaeze et al, (3) however showed much higher susceptibility to erythromycin 86.4%, chloramphenicol 70.27% which is not in agreement with the result of the present study which showed S. aureus isolates with very low susceptibility to erythromycin and ampiclox.

E.coli isolates from the present study showed highest susceptibility to ciprofloxacin 76.1% followed by streptomycin 75%, gentamycin 58.3%, peflacin 50% while they showed low susceptibility to ofloxacin and Augmentin (41.7%) each, ceporex and septrin 33.3% each, nalidixic acid 25% with least susceptibility to ampicillin 20.8%. (multi-drug resistance). This result has similarity with the result of Ferede et al, (12) on UTI in which E. coli isolates from their study showed high susceptibility to ciprofloxacin (100%) and gentamycin (90%) with 0% susceptibility to ampicillin. The result of the present study has some similarities with the

result of Amaeze et al, (3) since E. coli isolates from this study showed 58% susceptibility to gentamycin while E. coli isolates from their work showed 62.22% susceptibility to the same drug. The low susceptibility rates of E. coli isolates to augmentin, ampicillin and nalidixic acid in this study agrees with the low rates obtained by Amaeze et al (3) for augmentin 22.22%, ampicillin 13.33% and nalidixic acid 28.89%. E.coli isolates showed high susceptibility to streptomycin in this study 75% while they showed very low susceptibility of 15.6% to streptomycin in the study of Amaeze et al, (3). E.coli isolates showed low susceptibility to ofloxacin 41.7% in the present study while showing high susceptibility 71.11% to ofloxacin in the study of Amaeze et al, (3).

## CONCLUSION

This study showed high prevalence of 38% for UTI amongst female students of UNEC and 42% amongst female students of ESUT studied with overall prevalence of 40% for both schools studied when combined. Coagulase negative Staphylococcus were the commonest isolates in UTI in the present study followed by Escherichia coli and Staphylococcus aureus. Staying in crowded hostels, poor hostel sanitation, frequent sexual intercourse and wearing tight fitting underwear's were risk factors that showed association with UTI in UNEC students studied ( $P < 0.05$ ). Multi-drug resistance was detected for E. coli isolates, S. aureus isolates and the lone Proteus spp isolates in the present study. Levofloxacin followed by ciprofloxacin (for Gram positive isolates) and ciprofloxacin (for Gram negative isolates), have shown to be the most effective drugs for the treatment of UTI in these students studied. There is therefore the need for periodic screening of female students of universities for UTI followed by antibiotic susceptibility of the urinary isolates.

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