Journal of Basics and Applied Sciences Research (JOBASR)
ISSN (print): 3026-9091, ISSN (online): 1597-9962
Volume 3(3) May 2025
DOI: https://dx.doi.org/10.4314/jobasr.v3i3.4

Prevalence and Antibiotics Susceptibility of Uropathogens Isolated from Urinary Tract of Patients at St. Lukes Hospital Anua, Uyo

Dr. (MRS) Grace Michael Ikon[1], Abasiubong Victor Nelson[2*] and Anosike Ignatius Kelechi[3]
[1, 2 & 3]Obong University, Obong Ntak, Etim Ekpo Local Government Area, Akwa Ibom State, Nigeria.
Corresponding Author Email: [2]victorabasiubong@gmail.com
[1]degraceikon@gmail.com
[3]anosikeignatius@gmail.com

ABSTRACT
Urinarytract infections (UTI) are preventablebacterial infections encountered in the hospital and community settings. Despite the wide availability of antibiotics, uropathogens are among thebacterial infectionscommonly encountered with increasing antibiotic resistance.This study was carried out to establish the prevalence of bacterial isolates and their drug susceptibility patterns among the study population. A descriptive cross-sectional study was conducted using the outpatients and inpatientspresented with symptoms of UTIat St. Lukes Hospital Anua, Uyo. Purposeful sampling was used to obtain 385 respondents. Midstream urine samples were obtained from respondents using sterile bottles. Bacterial isolates identification was done using biochemical tests while culture and sensitivity pattern of the isolates were determined using disc diffusion method. A questionnaire was administered to the respondents and data associated with risk factors was collected and analyzed at a = 0.05. Out of 385 urine samples, 112 (29%) patients were confirmed positive for UTI. The prevalence of UTI was higher among females (62.1%) compared to males (37.9%). *Escherichia coli* (55%) was the most predominant followed *by Klebsiella pneumoniae* (10%), coagulase negative staphylococci (20.9%), *Staphylococcus aureus* (9.2%) and *Proteus mirabilis* (5%). The effectiveness of the antibiotics used varied among the isolates, and majority of the Gram positive isolates were sensitive to most antibiotics tested than the Gram negatives.Further 85% of the isolates were observed to be multidrug resistant, limiting treatment of UTIs with routinely used antibiotics. Hence, there is need for constant monitoring of antibiotics resistance for better management of patients on antibiotic treatment. In addition, the collected data could be used to determine the trends in antimicrobial susceptibility patterns and therefore, assists in policy formulation on the currently used antibiotics for management of UTIs.

Keywords:
Uropathogens,
Antibiotics
Susceptibility,
Urinary Tract infections.

INTRODUCTION

Urinary tract infection (UTI) is the colonization of the urinary tract by pathogenic microorganism. Infection is caused by fungi, bacteria and viruses. The infection has prolonged admissions in hospital, morbidity in general population and high financial cost implications to the patients, (Prakash and Saxena, 2013). Majority of UTIs are caused by bacteria that are found in the bowel and live as normal flora and often result from faecal and perineal areas. These organisms are capable invading the tissues of the urinary tract and adjacent tissues causing lower urinary infections and upper tract infections (Shilpi *et al*., 2012).UTI is a common condition that is found in very young children as well as older people (Tamber *et al*., 2006). In general population and hospital set up, UTI is a common infection although there are new and more powerful antibiotics in use but bacterial resistance persists (*Patel et al.,* 2012). The spectrum of a causative agents and their antimicrobial resistance pattern has been dynamic worldwide. Urinary tract infection may lead to life threatening complications and death (*Gupta et al*., 2001). Urine culture is the most effective diagnosis of UTI and treatment (Onuoha and Fatokun, 2014). Lower UTI (cystitis) and upper UTI (pyelonephritis) are the two clinical entities mostly found in patients with symptomatic UTI. Lesions

caused by UTI are severe and contribute to morbidity in the population resulting in loss of renal function, which leads to long-term illness (Lane and Mobley, 2007).

Urine passes through the urethra and allows the entry of uropathogens into the urinary tract initiating an inflammatory response. Uropathogens colonize urine in the urethra and if not washed out during urination culminating into a bacterial infection. Due to their anatomical orientation, that is the short distance between the anus and vagina, women are at a higher risk of getting UTIs (Foxman, 2010).A second re-infection occurs in about 50% of all women with first UTI within six months. Bacteria establish infection in the urinary tract only after overcoming possible elimination by normal flora during micturation and innate host defense mechanism in the bladder (Gupta *et al.,* 2017).Only about 2-5 % of documented UTIs are acquired hematogenously and usually result from bacteremia caused by relatively virulent organisms such *Salmonella* spp. and *Staphylococcus aureus*.According to the autoregressive study by He et al. (2025) from 1990 to 2021, the number of UTI cases increased by 66.45%, reaching 4.49 billion cases globally, with an age standardized incidence rate of 5,531.88 per population of 100,000 individuals. Another study reported 32.12% prevalence of UTI in sub-Saharan Africa, with the highest prevalence of 67.6% recorded in South Africa, followed by 43.65% in Nigeria and 38.25% in Zambia (Nwang' Onde and Mchami, 2022).

Common symptoms of UTIs include burning sensation during urination, loss of bladder control, increased frequency of urination especially in small amounts, low back pain, cloudy and bloody or foul-smelling urine (Onifade *et al.,* 2011). Multidrug resistance should be monitored worldwide and surveillance systems should be used to determine the aetiology for UTIs. There is a worldwide setback in management of many bacterial infectious diseases due to antibiotic resistance. It is estimated that globally 26% of deaths are due to infectious diseases such as UTIs of which 98 % occur in low income countries. Nigeria is among the low-income countries that bear impact of urinary tract infections (Wamalwa, 2013).

Therefore, the purpose of this study was to identify the major bacterial pathogens of UTI among patients in Nigeria, determine the prevalence of UTI in Nigeria and assay forthe antibiotics susceptibility patterns of the bacterial isolates. The result of this study will help to check the menace of antibiotic resistance due to UTI in Nigeria and beyond.

MATERIALS AND METHODS

Study Area

The study was carried out among UTI patients in St. Luke's Hospital Anua, Uyo. It is one of the biggest hospitals used as teaching and referrals that provide health care to millions of people living in Akwa Ibom state.Uyo is the capital City of Akwa Ibom state and lies between latitudes 4°58'N and 5°04'N and longitudes 7°51'Eand 8°01'E (Ekpenyong *et al*., 2020). It is bounded in the north by Ikono, Itu and Ibiono Ibom Local Government areas, in the East by Uruan LGA, in the west by Abak LGA and in the south by Ibesikpo Asutan and Nsit Ibom LGAs. The city covers an area of about 214.31square kilometers (Ekpenyong *et al.,* 2020). Also, Akwa Ibom is one of the states in the South-South geopolitical zone of Nigeria. It borders Cross River State to the east, Rivers State to the west, Abia State to the north-west, and the Atlantic Ocean to the south. The state takes its name from the Qua Iboe River which bisects the state before flowing into the Bight of Bonny (Onyeakagbu, 2021).

Sample Size Determination

According to Fisher *et al.,* (1993) prevalence of 50 % was considered since the prevalence of UTI of the patient was not available in this study area. The sample size was determined as follows:

$$N = \frac{z2\ (pq)D}{d2} \quad (1)$$

where, n = require sample size,

p = anticipated prevalence which was 50% (0.5) in this study,

q = failure which was calculated as 100-50 giving 50 % (0.5),

z = is the appropriate value from the standard normal deviate at 95 % level of confidence (1.96) in this study,

d = degree of precision set at 5 %.

From (1), the sample size is $n = \frac{1.96^2}{0.05^2}$

$=385$

Random sampling was used to obtain 385 respondents that is, as patients' samples came that day they were analyzed.

Inclusion Criteria

i Adult patients and children whose parents/guardians consented.

ii. Those patients presented with clinical symptoms associated with UTI

Exclusion Criteria

i. Patients who declined to sign the consent form.

ii. Children whose parents/guardians declined to sign the consent form.

ii. The patients who were on antibiotic therapy within one week were excluded.

Sample Collection and urinalysis

Sample Collection

Urine samples were collected from 385 patients using midstream technique for adults and urine bags for infants. In women, samples were taken after vulva

swabbing with sterile water. All specimens were analyzed as soon as possible after collection to avoid deterioration of leucocytes.

Processing of the specimen was done to meet the required number set for that day (Onifade *et al.*, 2011). Urinalysis was carried out using Uryyxon ® Relax (Bonn, Germany) (Urinometer). Drops of urine were put on to the strip and the strip inserted into it and sample was read before culturing to avoid sample contamination. It was used to identify the enzyme leukocyte esterase which indicates leukocytes. Presence of nitrite is an indicator of enterobacteria in urine, while protein indicates presence of infection and red blood cells indicates urinary tract infection.

Microscopic examination

In the first step of microscopic evaluation of UTI 10 ml of urine samples were centrifuged at 2000- 3000 x g for 5-10 minutes. After centrifugation, supernatant was removed and one drop of deposit was placed onto the microscope slides, covered with cover slips and examined using light microscope under 10x and 40X objectives. Presence of 1 – 4 bacteria was defined as bacteriuria and leukocytes more than 5 in one high power field (hpf) was defined as pyuria (O1adeinde *et al.*, 2011).

Isolation and identification of Microorganisms

The unrine specimens from all the patients were cultured on CLED agar (Oxoid LTD, UK) and identified to determine the microorganisms involved. Inoculation of urine specimen was done using sterile calibrated wire loop inoculating 0.001 ml of urine specimen onto CLED agar (Oxoid LTD, UK), The cultured media were then incubated at 37°C for 24 hours. The media which had no growth after 24 hours incubation were further incubated up to 48 hours before declaring absence of bacterial growth or negative. The numbers of isolated bacterial colonies were enumerated and were multiplied by dilution factor for the estimation of bacterial load per milliliter (ml) of urine sample.

Urine samples with colony were taken as significant growth (Positive urine culture =105 CFCml). The significant growth was identified further using biochemical reactions (Kolawale *et al.*, 2009).

Table 1: Standard antimicrobial inhibition zones according to Clinical laboratory Standards institute

Antibiotics	Resistant	Intermediate	Sensitive
Ampicilin (10μg)	≤13mm	14-16mm	≥16mm
Ciprofloxacin (30μg)	≤12mm	14-16mm	≥17mm
Co-trimoxazole (30μg)	≤10mm	11-15mm	≥16mm
Gentamicin(10μg)	≤12mm	13-14mm	≥15mm
Amoxicilin-lavulinic acid (10μg)	≤13mm	14-16mm	≥17mm
Nitrofurantoin (10μg)	≤14mm	15-16mm	≥17mm
Cefotaxime (10μg)	≤14mm	11-16mm	≥18mm
Nalidixic aide (30μg)	≤13mm	14-18mm	≥19mm

Data Management and Analysis

Data was collected and analyzed, and patients names were not used.Numbers and letters were used to label the samples. The raw data was entered into excel spreadsheets and later imported to statistical package for social sciences (SPSS version 15) for analysis. The antibacterial activity was reported in terms of diameters of the zones of inhabitation (mm). Comparison of means of zones of inhibition was done using student t-test since there was more than one variable in consideration and values of ($p<0.05$) were regarded as significant. Chi square test was used in findings on comparison of positive UTI cases according to individual characteristics. Evaluations were carried out at 95% confidence level and $P<0.05$ was considered statistically significant.

RESULTS AND DISCUSSION

Results

Prevalence of urinary tract infection

Of the 385 urine processed, 112(29.0%) showed significant growth where as the majority of the urine samples, that is 273 (71%) showed no growth. The assessment of associated risk factors showed that gender (χ^2= 0.116, P=0.0412), age group (P= 0.0120), history of UTI (χ^2 =2.742, P=0.004) and symptoms of UTI (χ^2 =0.895, P=0.017) were significant. Level of education (χ^2 =2.742, P=0.523) and catheterization (χ^2 = 0.17, P=0.054) were not significant (Table 2).

The ages between 25-34 years had the highest number of positive samples 125 (32.4%) followed by the ages between 15-24 years which had 124 (32.2%). Age group 55 and above had least number of positive samples 12 (3.1%) (Table 1). The prevalence in females, 239 (62 .1%) was higher than the males which was 146 (37.9%). Patients in different sex groups showed significance a difference (χ^2 =0.116, P=0.0412). Patients who had history of UTI were 341

(88.6%) while those having no history of UTI were 42 (10.9%).

Table 2: Risk factors associated with UTI at St. Luke Hospital, January to July, 2023 (N = 385)

	N = 385	Frequency (%)	Positive	Negative	Chi Square	p-value
Gender						
Male	146	37.9	41	105		
Female	239	62.1	71	108	0.116	0.0412
Total	385					
Age group (year)						
1 – 14	32	8.3	8	24		
15 – 24	124	32.2	39	85		
25 – 34	125	32.4	35	90		
35 – 44	68	17.7	22	46		
45 – 54	24	6.2	4	20		
≥ 55	12	3.1	4	8	2.918	0.012
Education						
Illiterate	12	3.3	9	3		
Primary	202	55.6	41	161		
Secondary	138	38.1	19	119		
Tertiary	11	3	2	9	2.742	0.523
Catheterization						
Yes	57	14.8	17	40		
No	328	85.2	95	233	0.17	0.0504
History of UTI						
Yes	341	88.6	99	242		
No	42	10.9	12	30	0.555	0.004
Outpatient/Inpatient						
Outpatient	355	92.2	83	272		
Inpatient	30	7.8	29	1		
Symptoms						
Yes	338	98	98	236		
No	47	14	14	37	0.895	0.017

Identification of uropathogens isolated using biochemical test

Bacterial isolates were 120. The Gram negative bacteria were more prevalent 82 (68.3%) than the Gram positive isolation 38(31.7%). The highest bacterial isolates were *Escherichia coli* 66 (54.8%) followed by coagulase negative Stapylococci 25 (20.8%). *S. aureus* 11 (9.2%) and *K. pneumonia* 12 (10%) (Table 3).

Table 3: isolates from the study population (n=120), at St. Luke Hospital, January to July 2023.

Microorganism	No. of Isolates	Percentage (%)
Gram negative rods		
Escherichia coli	66	55
Klebsiella pneumonia	12	10
Proteus Vulgaris	6	5
Gram positive cocci		
Staphylococcus aureus	11	9.2
Coagulase negative staphylococci	25	20.8
Total	**120**	**100**

E. coli isolates were identifies by lactose fermentation hence producing yellow colonies on CLED agar. Colonies were raised, smooth irregular edge and moist while others were dry. *E.coli* isolates were citrate negative; they did not utilize citrate and were identified by their green colour. They were urease test negative since they lacked the enzyme urease for breaking down urea. They produced tryptophase enzyme which cleaves tryptophan in the media producing indole which was detected by adding Kovac's reagent into it, reacting with indole forming a bright pink colourhence termed indole positive. Motility of *E.coli* was detected when

the broth was inoculated by stabbing vertically and growth spread within the entire medium forming a cloudy medium hence they were said to be motile.

K. peneumoniae isolates were subjected to the same procedures of biochemical teast. The bacteria reacted giving result as seen on table 4. On triple sugar iron (TSI) agar, *K. pneumoniae* fermented all the three sugars producing acid which turned the butt yellow and slant yellow with production of a gas which was not hydrogen sulphide.

The isolates of *P. mirabilis* were subjected to the same procedures of biochemical tests, the bacteria reacted giving the results (Table 4). On TSI, they fermented all the sugars producing acid which turned the butt yellow and slant red and utilized thiosulfate in the medium as a terminal electron acceptor reducing it to H_2S. This then reacted with sulphate in the medium, producing ferrous that gave a black precipitate. It was a positive test for TSI with an alkaline slant and acid butt producing H_2S. These reactions helped in identification of *P. mirablis. S. aureus isolates were*lactose fermenting microorganism hence produced yellow colonies on CLED agar. Colonies were round, smooth, raised, and measuring about 1-2mm in diameter. The biochemical reactions were catalase and coagulase positive while D-mennitol gave a positive fermentation test (table 4).

Table 4: Biochemical results for Gram negative isolates

Biochemical tests	***E. coli***	***K. Pnenumoiae***	***Proteus vulgaris***
(TSI) agar	+Ve	+Ve	+Ve
Citrate Utilization	-ve	+Ve	+Ve
Urease Production	-Ve	+Ve	+Ve
Motility	+Ve	-Ve	+Ve
Indole production	+Ve	-Ve	+Ve
Voges-proskauer test	-v	+Ve	N/A
Oxidation test	N/A	N/A	-Ve

-Ve =Negative, +Ve = Positive and N/A = Not applicable

Coagulase negative staphylococci were lactose fermenting organisms hence producing yellow colonies on CLED agar. Colonies were round, smooth. Raised, and measuring about 1-2 mm in diameter. The biochemical reactions showed that coagulase and D-mannitol gave a negative fermentation test while catalase gave a positive result (Table 5).

Table 5: Biochemical results for Gram positive isolates.

Biochemical tests	**CNS**	**Staphylococcus aureus**
Catalase test	+Ve	+Ve
Coagulase test	-Ve	+Ve
D-Mannitol fermentation	+Ve	-Ve

-Ve= Negative +Ve = positive, N/A = Not applicable and CNS =coagulase negative staphylococci

Antimicrobial susceptibility of bacterial uropathogens

Table 6: Antimicrobial susceptibility pattern of Gram-negativeuropathogens isolated from urine Culture of patients (n=82) at St. Luke Hospital, January to July 2023

Bacterial Isolate	**No. of isolates (n)**	**Patterns**	**NIT**	**CET**	**AMC**	**GET**	**NAL**	**CIP**	**AMP**	**SXT**
		S	53(80.3%)	45(68.2%)	20(30.3%)	44(66.7%)	19(69.7%)	46(69.7%)	22(33.3%)	12(18.3%)
E.coli	66	I	13(19.7%)	12(18.I%)	14(21.2%)	10(15.1%)	13(19.7%)	9(13.6%)	14(11.7%)	17(25.8%)
		R	0(0.0%)	9(17.7%)	32(48.5%)	12(18.2%)	34(51.5%)	11(16.7%)	30(45.5%)	41(61.1%)
			X^2=39.00	Df = 36	P = 0.006					
		S	7(58.3%)	9(75.0%)	8(66.7%)	3(25.0%)	6(50.0%)	7(58.3%)	0(0%)	0(0.0%)
K. pneumoniae	12	I	5(41.7%)	3(25.0%)	4(33.3%)	3(25.0%)	4(33.3%)	2(16.7%)	2(16.7%)	2(16.7%)
		R	0(0.0%)	0.(0.0%)	0.(0.0%)	6(50.0%)	2(16.7%)	3(25.0%)	10(83.3%)	10(83.3%)

			X^2= 25.80	Df =18	P = 0.0104					
		S	4(66.7%)	3(50.0%)	3(50.0%)	3(50.0%)	3(50.0%)	3(50.0%)	2(33.3%)	3(50.0%)
P. vulgaris.	6	I	4(33.3%)	2(33.3%)	2(33.3%)	2(33.3%)	1(16.7%)	1(16.7%)	3(50.0%)	2(33.3%)
		R	0(0.0%)	1(16.7%)	1(16.7.3)	1(16.7%)	2(33.3%)	2(16.7%)	1(16.7%)	1(16.7%)
				Df = 8	P = 0.006					

AMP = ampicillin, CIP = ciprofloxacin, SXT = co-trimoxazole GET = gentamicin, AMC = Amosicilin + clavulinic acid, NIT = nitrofurantoin, CET = Cefotaime, NAL = nalidixic acid.S = Sensitive, I = intermediate, R = Resistant .

The results of antimicrobial susceptibility pattern of Gram negative isolates ranged from 0 -100% (Table 6). All the isolates were sensitive to nitofurantoin 84 (100%). Most Gram negative isolates were sensitive to cefotaxime 74(89.3%), ciproflaxavin 68(80%), gentamicin 65(67.6%) amoxicillin – clavulinic acide 51 (60.7%), nalidixic acide 46 (54.8%), ampicillin 43(51.2%) and cotrimoxazole 36 (42.9%).

Among the Gram-negative islolates, the predominant one was *E.coli* 66(81%). Of the Gram – negatives, 55% of all isolates demonstrated resistance to contrimoxazole 41 (61.7%), followed by amocillin – clavulinic acid 32(48.8%).*E.coli* isolates were sensitive to nitrofurantoin 66 (86.7%), followed by cefotaxime 57(83.7%), and gentamcin 54 (81.3%) (table 6).

Table 7: Antimicrobial susceptibility pattern Gram positive uropathogens isolated from urine Culture of patients (n = 36) at St. Luke Hospital, January to July 2023.

Bacterial isolates	**No.of isolates**	**Patterns**	**NIT**	**CET**	**AMC**	**GET**	**NAL**	**CIP**	**AMP**	**SXT**
		S	8(72.0%)	9(81.0%)	7(63.6%)	3(27.0%)	5(45.5%)	3(27.3%)	5(45.5%)	3(27.3%)
S. aureus	**11**	**I**	3(27.0%)	2(18.0%)	4(26.4%)	4(36.0%)	2(18.2%)	3(27.3%)	3(27.3%)	3(27.3%)
		R	0(0.0%)	0(0.0%)	0(0.0%)	4(36.4%)	4(36.4%)	5(45.5%)	3(27.3%)	5(45.5%)
			X^2 =21750	df = 14	P= 0.084					
		S	17(69.0%)	20(78.0%)	17(69.6%)	8(30.0%)	3(13.0%)	18(73.0%)	5(21.7%)	4(17.4%)
CNS	**25**	**I**	8(30.0%)	5(22.0%)	8(30.4%)	5(21.0%)	7(26.1%)	7(27.0%)	7(26.1%)	8(30.4%)
		R	0(0.00%)	0(0.00%)	0(0.00%)	12(47.0%)	15(60.0%)	0(0.00%)	13(52.0%)	13(52.2%)
			x_2 = 392500							
Totalisolates	**36**									
		S+1	36(10.0%)	36(10.0%)	36(10.0%)	20(55.0%)	17(47.0%)	31(86.0)	20(55.0)	13(53.4%)
		R	0(0.0%)	0(0.0%)	0(0.0%)	16(44.0%)	19(53.0%)	5(13.9%)	16(44.0%)	12(46.6%)

AMP = ampicillin. CIP = ciprofloxacin, SXT = co-trimoxazole GET = gentamicn, AMC = amoxicillin + clavulinic acid, NIT = nitrofurantoin, CET = Cefotaime, NAl = nalidixic acid, CNS = Coagulase negative staphylococci.

Table 7 shows the results of antimicrobial susceptibility pattern of the Gram positive isolates. A rate of susceptibility of Gram positive isolates ranged from 0 - 100%. Majority of Gram positives were sensitive to most antibiotics tested than Gram negatives. All isolates were

highly sensitive to nitrofuration 36(100%) and amoxicillin –clavulininc acid 36(100%). Coagulase negative staphylococci which were predominant isolates from positives 25(69.4%) were sensitive to most antobioitics tested. Their sensitivity patterns of the isolates were found to be nitrofurantoin, Cefotaime, amoxilin – clavulinic acid, and ciprofloxacin 100%, respectively. Their resistance pattern only found in ampicillin 13 (52%) and gentamicin 12 (47%), respectively.

Among the total 120 isolates, resistance to the drugs were recorded in 108 (90%) of all uropathogens tested. Also, 77 (93.9%) isolates of Gram-negative bacteria and 31(81.6%) of Gram positive bacteria showed resistance to two or more drugs (Table 8).

Table 8: Resistance pattern of bacterial isolates to more than two antibiotics of patients (N = 120) at St. Luke Hospital, January 10 July 2023.

Bacteria Isolate	Total (%)	RO	RI	R(>2)
Gram Negative	84(70.0%)	5 (6%)	0	79(94%)
E. coli	66(80.5%)	1(1.2%)	0	65(98.5%)
Klebsiella pneumonia	12(14.3%)	3(3.5%)	0	8(66.0%)
Proteusvlgaris	6(5.9%)	1(1.2%)	0	5(83.3%)
Gram positive	36(69.4%)	4(19%)	0	23(63%)
CNS	25(69.4%)	4(16%)	0	23(92%)
S.aureus	11(30.5%)	3(27.3%)	0	8(72.7%)
Total	**120(100)**			

RO – NO antibiotic resistance, **R1-**Reisitance to one**, R2-** Rsistance to more than two drug**s.**

Discussion

Globally, urinary tract infection (UTI) is considered a major public health concern and the second most common bacterial infection affecting individuals of different ages. Bacteria are responsible for about 95% of UTIs. The emergence of antimicrobial resistance in uropathogens may lead topoor treatment outcomes in individuals with UTIs. The knowledge of the microorganism involves and antibiograms are important for the empirical treatment of UTIs. The results of this study will assist the clinicians to administer antibiotics after culture and susceptibility patterns are carried out and therefore reduce multidrug resistance in St Luke's Hospital Anua, Uyo.

The prevalence of urinary tract infections among patients in St. Luke Hospital was 29.1%. However, this study is in agreement with other reports which stress that UTI in Kenyatta National Hospital, Nairobi was 26.7% (Nabbugodi *et al.*, 2015) and in Khartoum North Hospital, Sudan it was 14.0 % (Hamdan *et al*., 2011), Mwanza North Western Tanzania 12.1% (Masinde *et al.* 2009) and Addis Ababa, Ethiopia was 11.6% (Kolawole et a., 2009) which were lower rates than that of St. Luke Hospital.

The prevalence rate of UTI in females was 62.1 % higher than in males (37.9 %) in this study.This high prevalence of UTI in females is comparable to prevalence rates of 64% in females and 36% reported by Kebira *et al.*, (2006). This could be due to the tendency of men buying antibiotics without prescription in chemists, local shops, supermarkets and from street vendors (Sosa *et al*., 2012). This was lower than the prevalence reported from Isfahani, Province, Iran (71 % female and 29 % male).In Mubi General Hospital, Yola- Nigeria (74 % female and 36% male). The high prevalence of infection in females (62.1 %) reported in this study is due to short urethra in females which may predispose them to ascending infection. Most women normally clean perineum area forward from the anus to the vulva instead of backward from vulva to the anus that can cause urinary tract infection. This practice keeps bacteria from getting into the urethra after a bowel movement. Sexual activity moves microorganisms from bowel to vaginal cavity and then urethral opening thus increasing the chances of occurrence of UTI in female patients from organisms that are normal flora of perianal and vaginal regions. There is a need to have high standard of cleanliness in females which will help in reducing the incidence of UTI. The presence of antimicrobial substances in prostatic fluid in males and longer urethra make them less prone to UTIs (Khoshkht *et al*., 2013; Tula and Iyoh, 2014). There was no significant difference between patient's level of education and UTI ($p = 0.523$). This is because they were equally infected. Thisagrees with studies carried out in Tanzania and Sudan (Masinde *et al*., 2009; Namdam *et al*., 2011).

The prevalence of UTI in patients with previous history of infection was significantly higher than of those without previous history ($p = 0.004$). The result agrees with studies carried out in Pakistan due to the presence of multidrug resistant microorganisms from those who had a previous historyof UTI (Sabir *et al*., 2002; Amin *et al*., 2009). This might be due to presence of resistance strains from those who had previous history of urinary tract infection. The prevalence of UTI among the patients with previous history of catheterization was significantly higher than those without history of previous catheterization ($p = 0.0504$). These findings were in agreement with previous report in Gonder (Mengistu *et al*., 2002) and was associated with predisposing factors such long duration of catheterization and contamination of the

urinary system during insertion of caterers (Amin *et al.*, 2009).

Isolation and Identification of Bacterial Pathogens

The prevalence of Gram-negative bacteria was 68.3 % (82) while that of Gram-positive isolates was 31.7% which was similar to rates, 75 % and 25 % respectively of isolation of Gram-negative and Gram-positive bacteria reported in Kenyatta National Hospital, Kenya The same rates of isolation of Gram-negative and Gram-positive bacteria of 60 % and 40 % were reported in Tirkur Anbessa Specialized Hospital Addis Abba, Ethiopia (Assefa *et al.*, 2008). Comparable rates of 61.9 % and 38.1% were reported in Tanzania (Sabrina *et al*, 2010). This could be associated with moisture and watery environment of the mucosal surface of the patients which helps in the invasion of bacteria to the uroepithelial cells. The initial attachments of microorganisms onto urinary tract tissues allow their replication and tissue invasion resulting in bladder infection and pyelonephritis in patients (Amin *et al.*, 2009).

Among the isolates, *E. coli* was the most predominant organism in St. Luke Hospital with total isolation prevalence of 55 %. These findings were more than those reported in other countries such as Yemen, 41.5 % Kenya, 42.1% Khartoum North Hospital, and in Sudan, 42.4 % (Hilbert *et al.*, 2011), These high rates were due to the presence of the normal flora in the rectal and vaginal area. Ánatomical and functional changes of females make it difficult to maintain personal hygiene and as result increase the risk of acquiring UTI (Shieve *et al*., 1986; Masinde *et al.*, 2009). Gram-positive coagulase negative staphylococci were the second dominant pathogens with total isolation prevalence of 20.8 %. These finding was higher than those reported from Tikur AnbessaSpecialized Hospital Addis Ababa, Ethiopia l6 % (Hilbert *et al*., 2011) and Tanzania 16.7 % (Masinde *et al.*, 2009). Gram-positive coagulase negative cocci were more common in urine samples among the sexually active young women (25-34 years). This is probably due to the fact that they are normal flora of both asymptomatic individuals and patients, thus taking the advantage of the weak defence mechanisms. This organism can be spread by hands or transmitted by animate or inanimate objects (Pelcar *et al.*, 2003).

Antimicrobial Susceptibility Pattern of Bacterial Uropathogens.

Susceptibility pattern of Gram-negative bacteria showed that all of the isolates were sensitive to nitraturantoin (100 9%). The rest of the isolates were sensitive to ciprofloxacin (79.8 %), cefotaxime (75.3 %), amoxicilin-clavulinic (72.8 %), gentamicin (67.6 %), nalidixic acid (65.6 %) cotrimoxazole (46.6%) and ampicillin (44%), It was contrary to a study done at Tikur Ahbessa Specialized Hospital Addis Ababa, Ethiopia (Assefa *et al*., 2008) which indicated that the susceptibility patterns of Gram-negative bacteria were Gentamicin (93.3%), Chloramphenical (83.3%), Contrimoxazole (73.3%) and amoxicilin-clavulinic acid (70 %).Which indicate their sensitivity to Gram negative bacteria

Availability and indiscriminate use of commonly used antibiotics without healthcare workers prescription lead to an increased multidrug resistance. Due to the increasing multidrug resistance among uropathogens, the healthcare workers are left with a limited choice to choose from the routinely used antibiotics for the treatment of urinary tract infections (Jaiswal *et al.*, 2013). This can be attributed to the fact that bacteria undergo mutation which makes their susceptibility vary from one geographical region to the other (Gupta *et al.*, 2017).

Nitrofurantoin was found to be effective (100%) to both Gram-positive and Gram-negative bacteria.This finding agrees with a previous report in Kenya (Mitemo and Kikuvi, 2004). It is used as a drug of choice for the treatment of uropathogens. Few of the isolated uropathogens showed resistance to more than two of the commonly used antibiotics. This was in agreement with findings reported in Tikur Anbessa Specialized Hospital Addis Ababa, Ethiopia (Toronko *et al.*, 2009) and could be due to abuse, misuse and underuse of antibiotics (Oladeinde *et al.*, 2011). Prevalence of multidrug resistance in this study was about 85% of the uropathogens isolated. The findings of nulidrug presence were similar to the prevalence (85%) reported by Kimando and Okemo (2010) of Kenyatta university. A lower prevalence(74%) was reported in Tikur Anblessa Specialized Hospital Addis Ababa, Ethiopia (Assefa *et al.*, 2008). This resistance rate could be contributed to antibiotic misuse or abuse (Albrich *et al.*, 2004). This could be attributed to few laboratory facilities that efficiently carry out culture and sensitivity which could lower drug resistance. It could also be due to inappropriate administration of antibiotics in empirical therapies and lack of correct infection control strategies which cause a shift to increase prevalence of resistant organisms in the community and hospitals (Gupta *et al.*, 2001; Kariuki *et al*., 2012).

CONCLUSION

The study showed that UTIs are the leading public-health problem in Nigeria. In our study, the predominantly isolated organisms responsible for UTI in Nigeria were *E coli*, *K pneumoniae* and *S. aureus*. The majority of the isolates were resistant to commonly prescribed antibiotics and resistance to more than two antibiotics was recorded in I08 (90%) isolates. Also, the females had a higher prevalence (62.1%) of UTI than the males (379%), and unary tract infection was associated with the previous infection

and with patients who had the history of catheterization.Therefore, routine monitoring and surveillance are crucial for the better management of patients, coupled with proper antibiotics susceptibility tests, so as to reduce the resistant uropathogens among the patients.

REFERENCE

Alemu, A. Moges F. Shiferans, Y., Tefess, A. Kassu, A. and Agegn, A. (2012). Bacteria profile and drug susceptibility pattern of Urinary tract infection in pregnant women at University of Gonder Teaching Hospital,Northwest Ethiopia.I*nternational journal of pharmaceutica*l sciences 5:1-15.

Ekpenyong R E, Etim E M, Ekpenyong R, Shaibu M. E, and Etim E (2020). Geospatial Analysis and Assessment of the Distribution of Petrol Stations in Uyo Capital City, Nigeria to Safeguard Human and Environmental Health. *International Journal of Social Sciences*. Vol. 13, No. 2, April–June, 2020.

Foxman, B. (2010). Epidemiology of Urinary tract infection. *American journal of medicine*, T: 653-660.

Gapta, K., Hooton, T. and Satamin,W. (2017).Increasing anticrobial resistance and management of uncomplicated community acquired urinary tract infections.A*nnual international journal of internal medicine*,135:41-50.

Gupta k, Hooton T. and stamina.W. (2001).Increasing antimicrobial resistance and management of uncomplicated community acquired urinary tract infections.A*nimal international medicine*,135:41-50.

He Y, Zhao Jin J, Wang L, Han C, Yan R, Zhu P, Qian T, Yu S, Zhu X & He W (2025). Epidemiological trends and predictions of urinary tract infections in the global burden of disease study 2021. *Sci Rep* **15**, 4702. https://doi.org/10.1038/s41598-025-89240-5

Lane, M. and Mobley,H.(2007).Role of P.fimbriae medicated adherence in pyeloniphiritis and persistence of Uropathogen E.coli in the mammalian kidney.Ki*dney internationa*l,72:19-25.

Nwang' Onde B. J. and Mchami, J. I. (2022). The aetiology and prevalence of urinary tract infections in Sub-Saharan Africa: a Systematic Review. *J Health Biol Sci*.10(1):1-7.

Onifade, A., Anibjuwon, I. and Azariah, E.(2011). Urinary tract infection in apparently healthy individuals in lle Ife,Nigeria:Detection of predominant microorganisms and antibiotics susceptibility profile. A*frican journal of Microbiology Research, 5:3233-3236.*

Onuoha, S and Fatokun, K. (2014). Prevalence and antimicrobial susceptibility pattern of Urinary tract infection among pregnant women in Afikpo,Ebonyi State Nigeria.A*merica journal of life sciences 2:46-52.*

Onyeakagbu, Adaobi (2021). "See how all the 36 Nigerian states got their names". *Pulse.ng*. Retrieved 22 December 2021.

Prakash, D. and Saxen, R. (2013). Distribution and antimicrobial susceptibility pattern of bacteria pathogens causing UTI in Urban community of mecrut city.jo*urnal of Microbiology,10:13-18.*

Patel, S. Taviab, P. Sinha M. Javadekar, T. and Chandhan,V.(2012). Urinary tract infection (UTI) among patients at G.G and medical college jamnager: *National journal of community medicine,3:1138-1141.*

Radyowisati, A. and Hark, H. (2003). Improving antibiotic use in low -income countries. An overview of evidence on determination. S*ocial science medicine,57:733-744.*

Shilpi, T., Hug, S. and Khatun, M. (2012). Pattern of bacteria causing urinary tract infection of inpatients and outpatients departments at Anivar Khan modern medical college hospital: A*nswer Khan Modern medical college Hospital 3:13-15.*

Tanner, D., Dhanovkar,D.Gulhane,S.,Khandelwal, V. and Dudhane, M. (2006). Antibacterial susceptibility of some urinary tract pathogen to commonly used antibiotics. A*frican journal of Biotechnology,5:1562-1565.*

Wamalwa, J. Omoloj and Makokha, A. (2013). A prevalence and Risk factors for urinary tract infection among pregnant women journals of Community Medicine.5:234_246.