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Phenotypic Profile and Antibiogram of Urinary Tract Pathogens Among Patients Attending a Tertiary Hospital in Katsina State, Nigeria

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Abstract

Undoubtedly, urinary tract microbial colonization and infections are common causes of frequent hospital visits for medical care. Because of paucity of data in regards to the prevalence of uropathogens in Katsina state, this cross-sectional study was carried out to determine the profile and antimicrobial susceptibility pattern of urinary tract infections (UTIs) in patients attending Federal Medical Center, Katsina, Northwestern Nigeria. A total of 4237 urine samples from in-patients and out-patients with suspected cases of UTIs between 3rd January and 30th December, 2015 were collected and analysed using standard microbiological protocols. Antimicrobial susceptibility testing was done using Kirby-Bauer disc diffusion method. Breakpoints were compared using values provided by the Clinical and Laboratory Standards Institute (CLSI). Multidrug resistance (MDR) was defined by resistance to ≥ 3 antibiotics. The prevalence of UTIs recorded was 9.7% with more isolates recovered more from females than male counterparts (1.47:1). The uropathogens isolated were *Escherichia coli (E. coli)* (52.2%), *Staphylococcus aureus (S. aureus)* (32.8%), *Klebsiella spp* (1.9%), *Streptococcus spp* (4.5%), *Pseudomonas aeruginosa* (4.1%), *Proteus spp* (2.4%) and *Candida albicans* (2.2%). Most of the bacterial isolates were susceptible to fluoroquinolones and least susceptible to nalidixic acid, co-trimoxazole and tetracycline. The prevalence of Multidrug resistant bacteria was 47.8%. Findings from this study revealed that *E.coli* remains the most predominant etiology of UTIs. More so, the presence of multi-drug resistance bacteria was high. Hence, It's recommended to treat urinary tract infections based on microbiology test results in order to prevent or minimize emergence and spread of multidrug resistant bugs.

1. Introduction

Urinary Tract Infections (UTIs) is a broad term that encompasses both asymptomatic microbial colonization of the urine and symptomatic infection with microbial invasion of

the urinary tract structures [1]. UTIs are one of the most common infections experienced by humans. Cases of UTIs among ambulatory patients come 3rd only after gastrointestinal and respiratory infections [2]. Worldwide, millions of people are diagnosed with UTIs each year [3]. Most infections are caused by retrograde ascent of bacteria from the faecal flora via the urethra to the bladder and kidney especially in the females who have a shorter and wider urethra, which more readily transfer these microorganisms [4]. About 1 in 3 women and 1 in 20 men will develop a urinary infection during their lifetime [5].

The most common causative bacterial agents of UTIs generally originate in the intestine. Despite the fact that antibiotics have revolutionized the management of many clinical syndromes caused by infections, their increasing used in many ways such as indiscriminate prescribing, inappropriate dosing and duration of treatment, over the counter availability of antibiotics to the general public have contributed to antibiotics resistance [6].

The emergence of antibiotic resistance in the management of UTIs is a serious public health problem particularly in the developing world where apart from high level of poverty, ignorance and poor hygiene practices, there is also a high prevalence of fake and spurious drugs of questionable quality in circulation [7]. Hence, the changing spectrum of microorganisms involved in UTIs and emergence of multidrug resistance across institutions and geographical areas have made it imperative for consistent investigation of antibiotic susceptibility of uropathogens in various regions of societies [8]. In cognizance of the paucity of data in regards to the prevalence of uropathogens in Katsina state, this cross-sectional study was carried out to determine the profile and antimicrobial susceptibility pattern of urinary tract infections in patients attending Federal Medical Center, Katsina, Northwestern Nigeria.

2. Materials and Methods

2.1. Study Design

This is a cross-sectional study of the microscopy, culture, and susceptibility of urine samples of patients submitted for microbiological testing at the Federal Medical Centre of Katsina state, from 3rd January to 30th December, 2015. A total of 4237 urine samples processed in the Medical Microbiology Laboratory of Federal Medical Centre, Katsina state, Nigeria were used in the study. The study subjects were both out-patients and in-patients.

2.2. Laboratory Procedures

A loopfull of all urine samples collected within this period were cultured on Cystein Lactose Electrolyte Deficient agar and MacConkey agar plates. The isolates considered were those with colony count $>10^5$ CFU/ml. The isolates were identified and confirmed using standard microbiological methods which included Gram staining, colonial morphology on media, and growth on selective media, lactose fermentation, catalase, oxidase, coagulase, indole, citrate utilization, litmus milk decolorization and Urease tests.

Antibiotic susceptibility of pure culture of confirmed isolates was performed on Mueller Hinton agar by the Kirby Bauer disc diffusion method using the appropriate Gram positive and Gram negative discs. Isolates were considered sensitive after incubation for 24 hours at 37^0C by measuring zone of inhibition with meter rule which was then compared with zone diameter interpretative to Clinical and Laboratory standard Institute (CLSI chart, 2015) for different organisms and antibiotics.

3. Results and Discussion

A Total of 4237 urine samples were collected from patients suspected of having UTIs, 418 showed significant bacteria growth and thus were included in the study. The gram negative organism constituted the largest group with a prevalence of 254 (59.5%) while the gram positive organism constituted 173(40.5%), the organism were *E.coli* (52.2%), *S. aureus* (32.8%), *Klebsiella spp* (1.9%), *Streptococcus spp* (4.5%), *Pseudomonas aeruginosa* (4.1%), *Proteus spp* (2.4%), *Candida albicans* (2.2%). *E. coli* was the most frequently isolated pathogen (Table 1). More isolates were recovered in the subjects of age group between 20-29 years and 30-39 years (Table 2). More isolates were recovered from outpatients (55%) than from inpatients (45%) (Table 1). Of the total positive cultures, 249 (59.6%) isolates were recovered from female patients while 169 (40.4%) isolates were recovered from male patients (Table 3).

The susceptibility of the clinical isolates to routinely prescribed antibiotics in the tertiary hospital is described in Tables 4-9. *E. coli* was the most prevalent bacteria with a susceptibility of 21.1% to Amoxacillin, 54.3% to Augmentin, 75.1% to Gentamicin, 58% to Pefloxacin, 64.3% to Ciprofloxacin, 16.7% to Ampiclox, 0% to Co-trimazole, 69.2% to Tarivid, 16.7% to Zinnacef, to 48.4% to septrin, 90.5% to Streptomycin, 0% to Coxacillin, 57.3% to Sparfloxacin, 0% to Clindamycin, 45.6% to Erythromycin, 39.7% to Nalixidic acid, 49.1% to Ceporex, 100% to Tetracyclin, 50% to Rocephine, 941.% to Levofloxacin, 66.7% to Ceftriazone, 50% to Penicillin, 100% to Chloramphenicol, and 48% to Netilimicin, The susceptibility of the other bacterial isolates followed similar patterns.

Staphylococcus aureus is highly resistant to Amoxacillin (84%), Ampiclox (80%) and septrin (53.5%) and highly sensitive to streptomycin (84.5%) and ofloxacin (80.0%). Streptococcus spp is highly resistant to Cotrimazole (66.7%) and highly sensitive to ciprofloxacin (100%) and ofloxacin (80.0%). *E coli* are the most frequent organism isolated among pregnant women in the study (Table 10). About 52.2% of the Gram negative isolates were resistant to at least three of the antibiotics. On the other hand, almost 43.6% of Gram positive isolates were resistance to at least three of the test antibiotics (Table 11).

Table 1. *Gender distribution of Uropathogens among Patients with UTIs.*

Gender	*E. coli*	*S. aureus*	*Klebiella spp*	*Streptocus spp*	*P. aeruginosa*	*Proteus spp*	*Candida albicans*
Male	103 (47.2)	37 (27)	1(12.5)	9(47.4)	11(64.7)	6(60)	2(22.2)
female	115 (52.8)	100(73)	7(87.5)	10(52.6)	6(35.3)	4(40)	7
Total	218(52.2%)	137(32.8%)	8(1.9%)	19(4.5%)	17(4.1%)	10(2.4%)	9(2.2%)

Table 2. *Age distribution of Uropathogens among Patients with UTIs.*

Age group	*E. coli*	*S. aureus*	*Klebiella spp*	*Streptococcus spp*	*P. aeruginosa*	*Proteus spp*	*Candida albicans*
0-9	29(13.3)	12(8.8)	0 (0)	2(10.5)	1(5.9)	2 (20)	1 (11.1)
10-19	22(10.1)	10(7.3)	1 (12.5)	2(10.5)	1(5.9)	1(10)	2 (22.2)
20-29	51(23.4)	39(28.5)	4(50)	8(42.1)	3(17.6)	2(20)	3(33.3)
30-39	42(19.3)	41(29.9)	1(12.5)	4(21.1)	2(11.8)	4 (40)	2(22.2)
40-49	26(11.9)	15(10.9)	0(0)	1(5.3)	3(17.6)	0(0)	1(11.1)
50 and above	48(22)	20(14.6)	2(25)	3(15.8)	4(41.2)	1(10)	0(0)

Table 3. *Microbial profile of UTIs by Source of patients.*

	Outpatients	Inpatients
E.coli	142 (52.2)	76 (53.5%)
S.aureus	89 (32.7%)	48 (33.8%)
Klebiella spp	5 (1.8%)	3 (2.1%)
Streptococcus spp	12 (4.4%)	3 (2.1%)
P. aeruginosa	11 (4.0%)	6 (4.2%)
Proteus spp	7 (2.6%)	3 (2.1%)
Candida spp	6 (2.2%)	3 (2.1%)

Table 4. *Antibiogram of Escherichia coli isolated from Patients with UTIs.*

Antibiogram pattern	AM (%)	AU (%)	CN (%)	PEF (%)	CPX (%)	APX (%)	COT (%)	OFX (%)	Z (%)	SXT (%)	S (%)	COX (%)	SP (%)
S	58 (21.1)	100 (54.3)	148 (75.1)	116 (58)	135 (64.3)	1 (17)	0(0)	135 (69)	1 (17)	90 (48)	180 (90)	0(0)	71 (57)
R	75(78.9)	84 (45.7)	49 (24.9)	84 (42)	75 (35.7)	5 (83)	6(100	60 (31)	5 (83)	96 (52)	19 (10)	2 (100	53 (43)

AM-Amoxacillin, AU-Augmentin, CN-Gentamicin, PEF-Pefloxacin, CPX-Ciprofloxacin, APX Ampiclox, COT-Co-trimazole, OFX-Tarivid, CIP-Ciprofloxacin, Z-Zinnacef, SXT-septrin, S-Streptomycin, COX-Coxacillin, SP-Sparfloxacin,

	CD (%)	TE (%)	CH (%)	E (%)	R (%)	PN (%)	CEP (%)	NA (%)	C (%)	LE (%)	NET (%)	CTR (%)
S	0(0)	5(100)	86 (69)	5 (46)	3 (50)	29 (50)	28 (49)	23 (40)	1 (100)	16 (94)	2 (67)	2 (67)
R	3 (100)	0(0)	38 (31)	6 (54)	3 (50)	29 (50)	29 (51)	35 (60)	0(0)	1(6)	1 (33)	1 (33)

CD-Clindamycin, E-Erythromycin, Z-Zinnacef, NA-Nalixidic acid, CEP-Ceporex, CIP-Ciprofloxacin, TE-Tetracyclin, COX-Coxacillin, COT-Co-trimazole, R-Rocephine, LE-Levofloxacin, CTR-Ceftriazone, PN-Penicillin, C-Chloramphenicol, NET-Netilimicin PN-Penicillin

Table 5. *Antibiogram of Klebsiella spp of among UTIs Uropathogens among Patients with UTIs.*

Antibiogram pattern	AM	AU	CN	PEF	OFX	S	SXT	SP	CPX	CH	PN	CEP	LE	NA
S	3 (60)	4 (50)	6(86)	4(57)	4(67)	7(100)	4 (57)	4 (80)	6 (86)	3 (75)	0(0)	2(100	1 (100)	1(50)
R	2 (40)	4 (50)	1 (14)	3(43)	2 (33)	0(0)	3 (43)	1 (10)	1 (14)	1 (15)	2(100)	0(0)	0(0)	1(50)

AM-Amoxacillin, AU-Augmentin, CN-Gentamicin, PEF-Pefloxacin, CPX-Ciprofloxacin, APX Ampiclox, COT-Co-trimazole, OFX-Tarivid, CIP-Ciprofloxacin, Z-Zinnacef, SXT-septrin, S-Streptomycin, COX-Coxacillin, SP-Sparfloxacin, CEP-Ceporex

Table 6. *Antibiogram of P. aeruginosa of among UTIs Uropathogens among Patients with UTIs.*

Antibiogram pattern	AM	AU	CN	PEF	OfX	S	SXT	SP	CPX	CH	PN	CEP	LE	NA
S	50 (50)	7(47)	10(67)	10(59)	12(71)	9(60)	9(60)	6 (60)	12 (75)	7 (78)	3(50)	4 (67)	0(0)	2(33)
R	50 (50)	8(53)	5(33)	7(41)	5(29)	6(40)	6(40)	4(40)	4 (25)	2 (22)	3(50)	2 (33)	1(100)	4(67)

AM-Amoxacillin, AU-Augmentin, CN-Gentamicin, PEF-Pefloxacin, CPX-Ciprofloxacin, APX Ampiclox, COT-Co-trimazole, OFX-Tarivid, CIP-Ciprofloxacin, Z-Zinnacef, SXT-septrin, S-Streptomycin, COX-Coxacillin, SP-Sparfloxacin, CEP-Ceporex PN-Penicillin

Table 7. *Antibiogram of Proteus spp isolated from Patients with UTIs.*

Antibiogram pattern	AM	AU	CN	PEF	OfX	S	SXT	SP	CPX	CH	PN	CEP	LE	NA
S	1(33)	5 (83)	6 (86)	6(86)	6 (86)	7(100)	4 (57)	2 (67)	6(86)	2(50)	2(67)	2 (50)	0(0)	2(50)
R	2(67)	1 (17)	1 (14)	1(14)	1 (14)	0(0)	3 (43)	1 (33)	1(14)	2(50)	1(33)	2(50)	0(0)	2(50)

AM-Amoxacillin, AU-Augmentin, CN-Gentamicin, PEF-Pefloxacin, CPX-Ciprofloxacin, APX Ampiclox, COT-Co-trimazole, OFX-Tarivid, CIP-Ciprofloxacin, Z-Zinnacef, SXT-septrin, S-Streptomycin, COX-Coxacillin, SP-Sparfloxacin, CEP-Ceporex PN-Penicillin

Table 8. *Antibiogram of Staphylococcus arueus isolated from Patients with UTIs.*

Antibiogram pattern	AM (%)	AMC (%)	AU (%)	CN (%)	PEF (%)	OFX (%)	SXT (%)	S (%)	CH (%)	SP (%)	APX (%)	PN (%)
S	13 (18.6)	18 (48.6)	15 (71.4)	84(73)	79 (80.6)	44 (91.7)	33 (46.5)	60 (84.5)	3 (60)	5 (71.4)	8 (13.8)	8(88.9)
R	57 (81.4)	19 (51.4)	6 (28.6)	31 (27)	19 (19.4)	4 (8.3)	38 (53.5)	11 (15.5)	2 (40)	2 (28.6)	50 (86.2)	1 (11.1)

AM-Amoxacillin, AMC-Ampicillin, AU-Augmentin, CN-Gentamicin, PEF-Pefloxacin, OFX-Tarivid SXT-septrin, S-Streptomycin, CH-Chloramphenicol, SP-Sparfloxacin, APX-Ampiclox, PN-Penicillin

	CPX (%)	CD (%)	E (%)	Z (%)	NA (%)	CEP (%)	TE (%)	COX (%)	COT (%)	R (%)	LE (%)	CTR (%)
S	103(90.3)	18 (90)	54 (65.1)	24 (39.3)	6 (85.7)	10 (100)	40 (100)	17 (85)	18 (85.7)	35 (63.6)	28 (93.3)	16 (76.2)
R	11(9.7)	2 (10)	29 (34.9)	37 (60.7)	1 (14.3)	0(0)	0(0)	3 (15)	3 (14.3)	20 (36.4)	2 (6.7)	5 (23.8)

CPX-Ciprofloxacin, CD-Clindamycin, E-Erythromycin, Z-Zinnacef, NA-Nalixidic acid, CEP-Ceporex, CPX-Ciprofloxacin, TE-Tetracyclin, COX-Coxacillin, COT-Co-trimazole, R-Rocephine, LE-Levofloxacin, CTR-Ceftriazone

Table 9. *Antibiogram of Streptococcus spp isolated from Patients with UTIs.*

Antibiogram pattern	COT (%)	COX (%)	E (%)	TE (%)	AMC (%)	CPX (%)	CD (%)	OFX (%)	CTR (%)	GEN (%)	LE (%)	NET (%)	S (%)
S	1 (33.3)	1 (100)	8 (80)	3 (100)	1 (33.3)	11(100)	1(100)	4 (100)	2(100)	2(100)	2(66.7)	2 (100)	9(81.8)
R	2(66.7)	0(0)	2 (20)	0(0)	2(66.7)	0(0)	0(0)	0(0)	0(0)	0(0)	1 (33.7)	0(0)	2 (18.2)

CPX-Ciprofloxacin, CD-Clindamycin, E-Erythromycin, CPX-Ciprofloxacin, TE-Tetracyclin, COX-Coxacillin, COT-Co-trimazole, LE-Levofloxacin, CTR-Ceftriazone, AMC-Ampicillin, GEN-Gentamicin,, OFX-Tarivid SXT-septrin, S-Streptomycin, SP-Sparfloxacin,

	PN (%)	CN (%)	AU (%)	SXT (%)	CEP (%)	NA (%)	PEF (%)	APX (%)	Z (%)	AM (%)	R (%)	CH (%)	SP (%)
S	1 (100)	9(81.8)	1(50)	12(85.7)	1 (100)	0(0)	10(90.9)	2 (25)	3(37.5)	5(50)	2(88.9)	0(0)	1 (100)
R	0(0)	2 (18.2)	1 (50)	4(14.3)	0(0)	1(100)	1(9.1)	6(75)	5(62.5)	5(50)	1 (11.1)	0(0)	0(0)

Z-Zinnacef, NA-Nalixidic acid, CEP-Ceporex, COT-Co-trimazole, R-Rocephine, AM-Amoxacillin, AU-Augmentin, PEF-Pefloxacin, SXT-septrin, CH-Chloramphenicol, SP-Sparfloxacin, APX-Ampiclox, PN-Penicillin

Table 10. *Microbial isolates among pregnant women.*

S. aureus	12	75.0%
E. coli	3	18.8%
Candida spp	1	6.2%

Table 11. *Frequency of Isolates with multidrug resistance.*

Bacteria	Multidrug Resistance (n)			
	3-4	5-6	7-8	9
E. coli (n=218)	29	41	40	8
S. aureus (n=137)	26	27	6	3
Klebiella spp (n=8)	3	0	1	0
Streptococcus spp (n=19)	3	1	2	0
P. aeruginosa (n=17)	0	2	3	2
Proteus spp (n=10)	2	0	1	0

The overall prevalence of UTIs in this study was 9.7% with more isolates recovered from females (59.6%) and male (40.4%). The sex distribution of patients in the present study was consistent with a previous study by Savas *et al* [9]. Previous report indicated that females to be more prone to having UTIs than males [10]. This could be because their urethra is shorter in females than males and is easily more readily transversed by microorganisms [11]. Women's propensity to develop UTIs has also been explained on the basis of certain behavorial factors, including delays in micturition and sexual activity. The antibacterial properties of prostatic fluid contribute to a lower rate of infection in males [12].

There was high number of isolates from outpatients (55%) and inpatients (45%). This can be due to the fact that UTIs is usually referred as outpatient ailment. However, this finding is against the report of Ochada *et al* [13] who reported a high prevalence among in-patients. The incidence of urinary tract infection increases greatly with age. Most of the uropathogens was recorded in subjects aged 50 years and above (22.0%) [14]. The high prevalence of UTIs observed in the aged people may be solely due to the inability of their immune systems to wade-off bacterial infection [13, 14]. This finding agrees with a 20 year period study in Japan where a trend of increasing number of elderly patients with complicated UTIs was reported [15].

A high prevalence of *S. aureus* (75.0%) and *E. coli* (18.8%) was observed in pregnant women. This could be due to poor genital hygienic among pregnant women in Katsina metropolis and inappropriate clean-up after defecation. This agrees with previous studies of Akerele and Okonofua [16] who observed an increasing trend in the prevalence of S.aureus infection among asymptomatic pregnant women in Benin City, Nigeria. The Gram negative bacteria (59.4%) constituted the largest group of bacteria isolated while Gram positive bacteria constituted (40.4%). *E.coli* (52.2%) was the most prevalent bacterial agent causing UTIs. This is possibly due to the availability in fecal matter and nature and its ubiquity. This finding is consistent with reports from other studies [17, 18] but differs from the reports of Ehinmidu [19] and Aboderin *et*

al [20] which recorded *P. aeruginosa* and *Klebsiella spp*, respectively as the most prevalent bacterial etiologies of UTIs.

Escherichia coli, the predominant etiologic organism of UTIs in this study showed moderate to high susceptibility to the fluoroquinolones (Ofloxacin, 69% and ciprofloxacin, 64.3%) and varying degree of susceptibility to other commonly used antibiotics. Their strong activities against these isolates of bacteria associated with UTIs are in conformity with the report of Daniyan and Abalaka [21]. This study provided significant antibiotic susceptibility of *E. coli* to fluoroquinolones.

The antibiogram of other gram negative isolates were similar in susceptibility to *E. coli, Klebiella spp* was highly susceptible to streptomycin (100%), ofloxacin (67%), sparfloxacin (80%) and *P. aeruginosa* had susceptibility of ofloxacin (71%), sparfloxacin (60%) and ciprofloxacin (75%). *Proteus spp* exhibited susceptibilities to streptomycin (100%), ofloxacin (86%) and ciprofloxacin (86%). The observed high level of the isolated organisms susceptible to fluoroquinolones might not be unconnected with the mode and spectrum of action.

The gram positive isolates were resistant to old generation drugs such as Nalidixic acid, Co-trimoxazole, tetracycline, augmentin and amoxycillin. The antimicrobial resistance of these isolates to amoxycillin, penicillin and co-cotrimazole is worrisome as they may have lost their value in the treatment of UTIs, this is in consonance with the findings of Oluremi *et al* [22]. The resistance of all the isolates to amoxycillin and penicillin could be related to beta-lactamase activity induced by the bacteria Resistance of UTIS pathogens to commonly used antibiotics such as may not be unconnected with their frequent prescription in the hospital, their easy availability in the community without prescription and their low cost which make them subject to abuse [7, 22].

Multi-drug resistance was high with *E. coli* and *S. aureus.* These rates are in tandem with previous findings [7, 22, 23, 24]. The presence of multidrug resistant bugs in these patients could be due to the presence of complicated UTIs that have failed previous therapy due to exposure to more resistant bacteria. This might have contributed to the high rate of multi-drug resistance recorded in this study.

4. Conclusion

Findings from this study revealed that *E. coli* remains the most predominant causative pathogens of UTIs, followed by *S. aureus.* UTIs are relatively common among females than the male counterpart. Most of the bacterial isolates were susceptible to fluoroquinolones. However, there were increased resistance to old generation such as Nalidixic acid, Co-trimoxazole, tetracycline and they might be fast losing their value in the treatment of UTIs. Hence, It's recommended to treat urinary tract infections based on microbiology test results in order to prevent or minimize multidrug resistant bugs.

References

[1] Calvin M. Urinary tract infections and pyelonephritis. In: Goldman Editor. Cecil textbook of Medicine. 21st edition. W. B. Sauders company, 2000. p.138

[2] Levi ME, Reddington J, Barth L. The patient with urinary tract infection. In: Schrier RW editor. Manual of Nephrology, 6th Edition. Lippincott Williams and Wilkins, 2005

[3] Gupta K. Increasing antimicrobial resistance and the management of uncomplicated community- acquired urinary tract infections. Int. J. Antimicrob. Agents. 2001;135: 41-50

[4] Jones RN, Inabo HI, Obanibi HBI. Antimicrobial susceptibility of some urinary tract clinical isolates to commonly used antibiotics. Afr. J. Biotechnol. 2006; 5(5): 487-489.

[5] Padmakumar B, Carty HM, Hughes DA, Judd BA. Role of intravenous urogram in investigation of urinary tract infection: an observation study. Postgrad. Med. J. 2004; 80: 424-425.

[6] Kerr JR. Antibiotic treatment and susceptibility testing. J. Clin. Pathol. 2005; 58(8): 786-787.

[7] Abubakar EM. Antimicrobial susceptibility pattern of pathogenic bacteria causing urinary tract infections at the Specialist Hospital, Yola, Adamawa State, Nigeria. Journ Clin Med Res. 2009; 1(1), 001-00.

[8] Agersew A, Mulat D, Meseret A, and Mucheye G. Uropathogenic Bacterial Isolates and their Antimicrobial Susceptibility Patterns among HIV/AIDS Patients Attending Gondar University Specialized Hospital Gondar, Northwest Ethiopia. Journal of Microbiology Research and Reviews. 2013; Vol. 1(4): 42-51.

[9] Savas L, Guvel S, Onlen Y, Savas N, Duran N. Nosocomial urinary tract infections: microorganisms, antibiotic sensitivities and risk factors. West Indian Med. J. 2006; 55(3): 1-9.

[10] Kolawale AS, Kolawale OM, Kandaki-Olukemi YT, Babatunde SK, Durowade KA, Kolawale CF. Prevalence of urinary tract infections among patients attending Dalhatu Araf Specialist Hospital, Lafia, Nasarawa State, Nigeria. Int. J. Med. Med. Sci. 2009: 1(5):163-167

[11] Inabo HI, Obanibi HBT. Antimicrobial susceptibility of some urinary tract clinical isolates to commonly used antibiotics. Afr. J. Biotechnol. 2006; 5(5): 487-489.

[12] Abubakar EM. Antimicrobial susceptibility pattern of pathogenic bacteria causing urinary tract infections at the Specialist Hospital, Yola, Adamawa state. J Clin Med Res 2009; Vol. 1(1): 001-008.

[13] Ochada, NS, Nasiru IA, Thairu Y, Okanlowan MB, Abdulakeem YO. Antimicrobial susceptibility pattern of urinary pathogens isolated from two tertiary hospital in south western Nigeria. Afr J Clin Exp Microbiol. 2015; 16(1): 12-22

[14] Abdulraheem IS. Acute UTIs in the elderly- A rational approach to diagnosis and treatment. Niger. J. Genito-urinary Med. 2005; 5:25-31.

[15] Shigemura K, Tanaka K, Okada H, Nakano Y, Kinoshita S, Gotoh A, Arakawa S, Fujisawa M. Pathogen occurrence and antimicrobial susceptibility of urinary tract infection cases during a 20-year period (1983-2002) at a single institution in Japan. Jpn. J. Infect. Dis. 2005; 58: 303-308.

[16] Akerele P, Okonofua JA. Prevalence of asymptomatic bacteriuria among pregnant women in benin city, Nigeria. J. Obster Gynae. 2001: 21(2):141-144.

[17] Daza R, Gutiserrez J, Piedrola G. Antibiotic susceptibility of bacteria strains isolated from patients with community-acquired urinary tract infections. Int. J. Antimicrob. Agent. 2001;18: 211-215.

[18] Dimitrov TS, Udo EE, Emara M, Awni F, Passadilla R. Etiology and antibiotic susceptibility patterns of community – acquired urinary tract infections in a Kuwait hospital. Med. Princ. Pract. 2004; 13: 334-339.

[19] Ehinmidu JO. Antibiotic susceptibility patterns of urine bacterial isolates in Zaria, Nigeria. Trop. J. Pharm. Res. 2003;2(2): 223-228.

[20] Aboderin OA, Abdu A, Odetoyinbo BW, Lamikanra A. Antimicrobial resistance in Esherichia coli strains from urinary tract infections. Natl. Med. Assoc. 2009; 101: 1268-1273.

[21] Daniyan S. Y and Abalaka M. E. Frequency and susceptibility profile of pathogens associated with Urinary tract infection. Am J Trad Med Pharm Sci. 2013; 1 (1), 1-7.

[22] Oluremi BB, Idowu AO, Olaniyi JF. Antibiotic susceptibility of common bacterial pathogens in urinary tract infections in a Teaching hospital in Southwestern Nigeria. Afr J Microb Res 2011; 5(22), pp. 3658-3663.

[23] Oladeinde BH, Omoregie R, Olley M, Anunibe JA. Urinary tract infection in a rural community of Nigeria, North Am J Med Sci. 2011; 3(2); 75–77.

[24] Uwaezuoke JC, Ogbulie N. Antibiotic sensitivity pattern of urinary tract pathogens in Port-Harcourt, Nigeria. J. Appl. Sci. Environ. Manage. 2006;10(3): 103-107.