Research Article

Prevalence and Antimicrobial Susceptibility of Uropathogens among HIV-infected and HIV-negative Patients Attending Clinics in Mater Misericodiae Hospital, Afikpo, Ebonyi State, Nigeria

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ABSTRACT

Urinary tract infection (UTI) is one of the most common infections prominent in HIV-infected and non-HIV patients and according to contemporary studies; it contributes mostly to the cause of morbidity and hospitalization among patients but more among HIV-infected individuals. This study was aimed to determine the prevalence of uropathogens among the HIV-positive and negative individuals attending clinics in Mater Misericodiae Hospital, Afikpo, Ebonyi State, Nigeria. Two hundred (200)mid-stream urine samples; 100 each from HIV-positive and negative individuals were collected, cultured and isolates were characterized for uropathogens. Antibiotic susceptibility test was done using Kirby-Bauer disc diffusion method. Results revealed a remarkable dominance of *Escherichia coli* in both urine of HIV-infected and HIV-negative patients with frequency values of 28(41.18%) and 20(54.05 %) respectively. This was closely followed by *Staphylococcus* species with frequency values of 19 (27.94%) and 6 (16.22%) in HIV-infected and HIV-negative urine samples respectively. UTI was highest between the age group 31-35 years among HIV-infected and HIV-negative patients with frequencies of 24(35.29%) and 10(27.02%) respectively. HIV-infected female patients had higher UTI prevalence when compared to HIV-infected male patients. Antibiotic susceptibility results showed that most uropathogens from HIV-infected patients were highly susceptible to ertapenem, cefepime, amoxicillin/tazobactam, levofloxacin, and gentamycin but highly resistant toticarcillin, sulphamethoxazole/trimethoprim, mupirocin, chloramphenicol, oxacillin, and erythromycin. Mosturopathogens isolated from non-HIV urine samples were highly susceptible to ofloxacin, ertapenem, cefepime, amoxicillin/tazobactam, and levofloxacin but exhibited high resistance to mupirocin, nalidixicacid, sulphamethoxazole/trimethprim, oxacillin and gentamycin. The MARI value of the uropathogens isolated from the urine samples ranged from 0.23-0.50, thus further depicting multi-drug resistance traits. This study revealed that multi-drug resistant uropathogenic bacteria with similar antibiotic resistance profiles were prevalent among HIV-infected and HIV-negative patients attending clinics in Mater Misericodiae Hospital, Afikpo, Ebonyi State, Nigeria.

Keywords: Uropathogens, UTIs, clinic, HIV, multi-drug resistance

INTRODUCTION

The progressive failure of the immune system due to the antagonistic effect of Human Immunodeficiency Virus (HIV) and its consequential opportunistic infections such as UTIs among HIV patients is sometimes life-threatening and perhaps the major cause of morbidity and hospitalization among HIV-positive individuals.[1,2]UTIs is one of the principal infections amongst HIV patients. UTIs are the microbial pathogens infiltration and colonization of the urinary tract, causing the inflammation of the urothelial cells.[3,4] Globally, UTIs have been reported by various researchers, as the most prevalent hospital and community acquired human infection of the bacteria origin, with high morbidity and mortality prognosis. Occurrence of uropathogens appears to be varying among different age groups, sex, hospitalization and rate of exposure to antibiotics.[3] In view of women's shorter urethra, females may likely have higher predisposition to UTIs than males, hence a study reported that about 40-50 % of all healthy women have been diagnosed with UTIs at least once or more in their life time. The infecting pathogens in urinary tract infections are mainly from normal anal and genital flora. Of all the uropathogens, *Escherichia coli*, *Staphylococcus* species, *Klebsiella* species, and *Pseudomonas* species are mostly implicated in UTIs. However, *Streptococcus pneumoniae* and *Hemophilus influenzae*, typhoidal *Salmonella*, *Staphylococcus aureus* and *Pseudomonas aeruginosa* have once or more been implicated in UTIs. Human pathogenic organisms may be excreted in large numbers in biological specimen such as urine and

subsequently transmitted directly (surface-to-mouth contamination) or indirectly (hand-to-mouth contamination) through the eyes, nose, mouth or any other route of entry to the body.[2]Meanwhile,since there is a believe that urinary tract infection is found among HIV-infected and HIV-negative patients; and that it poses a serious threat to the management and welfare of HIV-infected patients, there is an urgent need to determine the prevalence of uropathogens in our locality among the HIV-positive and HIV-negative patients to ensure proper medical advice on the best drug of choice since there is a progressive resistance to some commonly available antibiotics.[5] Hence, this study was designed to isolate and characterize uropathogens from HIV-positive and HIV-negative patients attending clinic in Mater Misericodiae Hospital, so as to better understand its prevalence/ percentage occurrence and their antimicrobial resistance profile in our study area.

MATERIALS AND METHODS

Study Area and Collection of Samples

Two hundred (200) mid-stream, clean-voided urine samples; 100 each from HIV-infected and HIV-negative patients were collected at the Mater Misericodiae Hospital (MMH), Afikpo, Ebonyi State, Nigeria using a sterilized universal container. The bottles were labeled appropriately with participants' details and sent to microbiology laboratory of MMH, Afikpo for bacteriological analysis immediately after collection. The distilled water used for serial dilution was autoclaved at 121^0C for 15 minutes while the working area was swabbed with 70%alcohol before and after use. All the media used were aseptically prepared according to the manufacturer's instruction.

Bacteriological analysis

The urine samples were cultured on sterilized Mac Conkey agar, cysteine lactose electrolyte deficiency (CLED) agar, mannitol salt agar and subsequently incubated at 37^0C for 18-24 hours. Significant bacteria growth was further subjected to microscopy, sub-culturing, Gram staining, biochemical and sugar fermentation tests. The biochemical tests such as catalase test, oxidase test, indole test, coagulase test, citrate utilization test, and sugar fermentation test were carried out for proper identification and characterization of the bacterial isolates as described by Cheesebrough.[6]

Antibiotic sensitivity test

Antibiotic susceptibility testing was done using disc diffusion method as described by Kirby and Bauer with the following antibiotics; clindamycin, (15 µg), vancomycin (10 µg), erythromycin (15 µg), ofloxacin (5µg), cefepime (30 µg), chloramphenicol (10 µg), gentamicin (30 µg), ertapenem (10 µg), nalidixic acid (30 µg), levofloxacin (5 µg), oxacillin (1 µg), trimethoprim-sulfamethoxazole (25µg) and piperacillin/tazobactam (30µg). The diameter of the zones of inhibition was recorded in milliliter using a calibrated meter rule. Results were interpreted as susceptible or resistant according to Clinical Laboratory Standard Institute (CLSI).[7]

Determination of Multiple Antibiotic Resistance Index (MARI)

MARI of the bacterial isolates was calculated as the number of antibiotics to which the tested bacterial isolates exhibited resistance (a), divided by the total number of antibiotics tested against isolates (b).[8,9]

RESULTS

Escherichia coli was remarkably the most prevalent uropathogen in the urine samples from both HIV-infected and HIV-negative patients with prevalence frequency values of 28(41.18%) and 20(54.05%) respectively. *Staphylococcus* species was the second most prevalent uropathogenin the urine samples from HIV-infected and HIV-negative patients with frequency values of 19 (27.94%) and 6 (16.22%) respectively. Conversely, *Pseudomonas* species had the least prevalence (1 (1.47%)) among the five bacterial species isolated (Table 1).

Results revealed that HIV-infected females have more UTIs with occurrences frequency value of 45 (78.95%) (Table 2).

The frequency of UTIs amongst HIV-positive and HIV-negative patients of different age groups showed that HIV-infected patients between the age group of 31-35 years had the highest UTI prevalence with value of 24(35.29%). This was closely followed by HIV-infected patients between the age group of 26-30 years with prevalence value of 17 (25.00 %). No occurrence of UTIs was recorded among the HIV patients within age groups of<25, 61-65, and >65years. However, the highest occurrence of UTIs being 10(27.02%) was found in non-HIV patients between the ages of 31-35 years, followed by non-HIV patients between 36-40 years with occurrence frequency of 8(21.62%) (Table 3).

Antibiotic susceptibility results reveal that *Escherichia coli* was completely susceptible (100 %) to both ertapenem (ETP) and cefepime (FEP), while *Klebsiella* species, *Proteus*, and *Pseudomonas* species were absolutely susceptible (100%) to only amoxicillin/tazobactam (TZP).*Proteus* species equally showed complete susceptibility (100 %) to ertapenem (ETP), cefepime (FEP), and ofloxacin (OFX).*Pseudomonas* species also showed total susceptibility (100 %) to nalidixic acid (NA), ertapenem (ETP), gentamycin (CN), amoxicillin/tazobactam (TZP), and ofloxacin (OFX).*Staphylococcus* species exhibited complete susceptibility (100%) to levofloxacin (LEV), and gentamicin among the uropathogens (Table 4-8).

E coli and *Klebsiella* species were highly susceptible (90 %) to ofloxacin among the uropathogens isolated from the HIV-negative patients while *Staphylococcus* species were completely susceptible (100 %) to levofloxacin. *Proteus*

species showed complete susceptibility (100 %) to cefepime, and ofloxacin whereas *Pseudomonas* species was not isolated from urine samples of HIV-negative patients (Table 8).*E.coli* showed highest resistance (65 %) to mupirocin while *Klebsiella* species showed highest resistance (71.43 %) to both nalidixic acid and sulphamethoxazole/trimethoprim. Highest resistance frequency value of 66.67 % was recorded for oxacillin by *Staphylococcus* species with no resistance to levofloxacin while *Proteus* species exhibited the highest resistance frequency (75 %) to gentamycin and no resistance to cefepime and ofloxacin was recorded (Table 4-8).

The Multiple Antibiotic Resistance Index (MARI) value of the isolated uropathogens from urine samples of HIV-positive and HIV-negative patients revealed that *Pseudomonas* species had the highest average MARI value of 0.50; followed by *Klebsiella* species with an average MARI value of 0.43, while *Staphylococcus* species showed the least average MARI value of 0.23. Contrastingly, among bacteria isolated from urine sample of HIV-negative patients, *Klebsiella* species had the highest average MARI value of 0.47; followed by *Proteus* species with average MARI value of 0.38, while *Staphylococcus* species showed the least average MARI value of 0.32. *Pseudomonas* species was not isolated in the urine samples of HIV-negative patients (Table 9).

RESULTS

Table 1: Frequency distribution of bacterial uropathogens in HIV-positive and HIV-negative patients attending clinic in MMH, Afikpo

S/N	Type of isolates	No of isolates (%) from HIV-positive patients	No of isolates (%) from HIV-negative patients	Total (%)
1	*Escherichia coli*	28(41.18)	20 (54.05)	48 (45.71)
2	*Staphylococcus* species	19 (27.94)	6 (16.22)	25(-23.81)
3	*Klebsiella* species	16 (23.53)	7 (18.92)	23 (21.90)
4	*Proteus* species	4 (5.88)	4 (10.81)	8 (7.62)
5	*Pseudomonas* species	1 (1.47)	0 (0.00)	1 (0.95)
	Total	**68 (64.76)**	**37 (35.24)**	**105**

Table 2: Distribution of Uropathogens based on gender among HIV-positive and HIV-negative patients attending clinic in MMH, Afikpo.

	MALE		Female		Total	
	No Tested	No Infected	No Tested	No Infected	No Tested	No Infected
HIV patients	43	23 (53. 49)	57	45 (78.95)	100	68 (68.00)
Non-HIV patients	56	20 (35.71)	44	17 (40.91)	100	37 (37.00)
TOTAL	**99**	**43 (43.43)**	**101**	**62 (61.39)**	**200**	**105**

Table 3: Age distribution of HIV-positive and HIV-negative patients with Urinary tract infections (UTIs) in MMH, Afikpo.

S/N	Patients age	HIV patients	Non-HIV patients	Total (%)
		n(%)	n (%)	
1	<25	0 (0.00)	1 (2.70)	1 (0.95)
2	26-30	17 (25.00)	0 (0.00)	17 (16.19)
3	31-35	24 (35.29)	10 (27.02)	34 (32.38)
4	36-40	12 (20.69)	8 (21.62)	20 (19.05)
5	41-45	5 (7.35)	0 (0.00)	5(4.76)
6	46-50	3 (4.41)	2 (5.41)	5 (4.76)
7	51-55	2 (2.94)	9 (24.32)	11 (10.48)
8	56-60	5 (7.35)	0 (0.00)	5 (4.76)
9	61-65	0 (0.00)	5 (13.51)	5 (4.76)
10	>65	0 (0.00)	2 (5.41)	2 (1.90)
	Total	**68 (64.76)**	**37 (35.24)**	**105**

Table 4: Antibiotic sensitivity of *Escherichia coli* isolates from urine samples of HIV-positive and HIV-negative patients attending clinic in MMH, Afikpo.

S/N	Antibiotics	HIV-positive			HIV-negative		
		No of isolates	Susceptibility n (%)	Resistance n (%)	No of isolates	Susceptibility n (%)	Resistance n (%)
1	MUP	28	6 (21.43)	22 (78.57)	20	7 (35.00)	13 (65.00)
2	C	28	10 (35.71)	18 (64.29)	20	10 (50.00)	10 (50.00)
3	NA	28	8 (28.57)	20 (71.42)	20	9 (45.00)	11 (55.00)
4	TIC	28	3 (10.71)	25 (89.26)	20	13 (65.00)	7 (35.00)
5	ETP	28	28 (100.00)	0 (0.00)	20	16 (80.00)	4 (20.00)
6	CN	28	21 (75.00)	7 (25.00)	20	12 (60.00)	8 (40.00)
7	FEP	28	28 (100.00)	0 (0.00)	20	16 (80.00)	4 (20.00)
8	OFX	28	24 (85.71)	4 (14.29)	20	18 (90.00)	2 (10.00)
9	SXT	28	3 (10.71)	25 (89.26)	20	9 (45.00)	11 (55.00)
10	TZP	28	27 (96.43)	1 (3.57)	20	15 (75.00)	5 (25.00)

Key: Mupiroin (MUP), Chloramphenicol (C), Nalidixic acid (NA), Ticarcillic (TIC), Ertapenem (ETP), Gentamycin (CN), Cefepime (FEP), Ofloxacin (OFX), Sulphamethoxazole/Trimethoprim (SXT), Amoxicillin/Tazobactam (TZP).

Table 5: Antibiotic sensitivity of*Klebsiella* species isolated from urine samples of HIV-positive and HIV-negative patients attending clinic in MMH, Afikpo.

		HIV-positive			HIV-negative		
S/N	Antibiotics	No of isolates	Susceptibility n (%)	Resistance n (%)	No of isolates	Susceptibility n (%)	Resistance n (%)
1	MUP	16	3 (18.75)	13 (81.25)	7	3 (42.86)	4 (57.14)
2	C	16	6 (37.50)	10 (62.25)	7	3 (42.86)	4 (57.14)
3	NA	16	7 (43.75)	9 (56.25)	7	2 (28.57)	5 (71.43)
4	TIC	16	8 (50.00)	8 (50.00)	7	4 (57.14)	3 (42.86)
5	ETP	16	12 (75.00)	4 (25.00)	7	5 (71.43)	2 (28.57)
6	CN	16	7 (43.75)	9 (56.25)	7	3 (42.86)	4 (57.14)
7	FEP	16	14 (87.50)	2 (12.50)	7	3 (42.86)	4 (57.14)
8	OFX	16	13 (81.25)	3 (18.75)	7	6 (85.71)	1 (14.28)
9	SXT	16	3 (18.75)	13 (81.25)	7	2 (28.57)	5 (71.43)
10	TZP	16	16 (100.00)	0 (0.00)	7	6 (85.71)	1 (14.28)

Key: Mupirocin (MUP), chloramphenicol (C), Nalidixic acid (NA), Ticarcillic (TIC), Ertapenem (ETP), Gentamycin (CN), Cefepime (FEP), Ofloxacin (OFX), Sulphamethoxazole/Trimethoprim (SXT), Amoxicillin/Tazobactam (TZP).

Table 6: Antibiotic sensitivity of *Staphylococcus* species isolated from urine samples of HIV-positive and HIV-negative patients attending clinic in MMH, Afikpo.

		HIV-positive			HIV-negative		
S/N	Antibiotics	No of isolates	Susceptibility n (%)	Resistance n (%)	No of isolates	Susceptibility n (%)	Resistance n (%)
1	LEV	19	19(100.00)	0(0.00)	6	6(100.00)	0(0.00)
2	OX	19	9(47.37)	10(52.63)	6	2(33.33)	4(66.67)
3	DA	19	16(84.21)	3(15.79)	6	5(83.33)	1(16.67)
4	E	19	11(57.89)	8(42.11)	6	3(50.00)	3(50.00)
5	VA	19	16(84.21)	3(15.79)	6	4(66.67)	2(33.33)
6	CN	19	19(100.00)	0(0.00)	6	4(66.7)	2(33.33)

Key: Levofloxacin (LEV), Oxacillin (OX), Clindamycin (DA), Erythromycin (E), Vancomycin (VA), Gentamycin (CN).

Table 7: Antibiotic sensitivity of *Proteus* species isolated from urine samples of HIV-positive and HIV-negative patients attending clinic in MMH, Afikpo.

		HIV-positive			HIV-negative		
S/N	Antibiotics	No of isolates	Susceptibility n (%)	Resistance n (%)	No of isolates	Susceptibility n (%)	Resistance n (%)
1	MUP	4	1 (25.00)	3(75.00)	4	2 (50.00)	2 (50.00)
2	C	4	1 (25.00)	3 (75.00)	4	2 (50.00)	2 (50.00)
3	NA	4	2 (50.00)	2 (50.00)	4	2 (50.00)	2 (50.00)
4	TIC	4	3 (75.00)	1(25.00)	4	2 (50.00)	2 (50.00)
5	ETP	4	4(100.00)	0 (0.00)	4	3 (75.00)	1 (25.00)
6	CN	4	3 (75.00)	1(25.00)	4	1 (25.00)	3 (75.00)
7	FEP	4	4 (100.00)	0 (0.00)	4	4 (100.00)	0 (0.00)
8	OFX	4	4 (100.00)	0 (0.00)	4	4 (100.00)	0 (0.00)
9	SXT	4	1 (25.00)	3 (75.00)	4	3 (75.00)	1 (25.00)
10	TZP	4	4 (100.00)	0 (0.00)	4	2 (50.00)	2 (50.00)

Keys: Mupiroin (MUP), Chloramphenicol (C), Nalidixic acid (NA), Ticarcillic (TIC), Ertapenem (ETP), Gentamycin (CN), Cefepime (FEP), Ofloxacin (OFX), Sulphamethoxazole/Trimethoprim (SxT), Amoxicillin/Tazobactam (TZP).

Table 8: Antibiotic sensitivity of *Pseudomonas* Species isolated from urine samples of HIV-positive and HIV-negative patients attending clinic in MMH, Afikpo

S/N	Antibiotics	HIV-positive			HIV-negative		
		No of isolates	Susceptibility n (%)	Resistance n (%)	No of isolates	Susceptibility (%)	Resistance (%)
1	MUP	1	0 (0.00)	1(100.00)	-	-	-
2	C	1	0(0.00)	1 (100.00)	-	-	-
3	NA	1	1(100.00)	0(0.00)	-	-	-
4	TIC	1	0(0.00)	1(100.00)	-	-	-
5	ETP	1	1(100.00)	0 (0.00)	-	-	-
6	CN	1	1 (100.00)	0(0.00)	-	-	-
7	FEP	1	0 (0.00)	1 (100.00)	-	-	-
8	OFX	1	1 (100.00)	0 (0.00)	-	-	-
9	SXT	1	0(0.00)	1(100.00)	-	-	-
10	TZP	1	1 (100.00)	0 (0.00)	-	-	-

Table 9: MARI of isolates of *Escherichia coli* from urine samples of HIV-positive and HIV-negative patients attending clinic in MMH, Afikpo.

S/N	ORGANISM	MARI-HIV	MARI-Non-HIV	ORGANISM	MARI-HIV	MARI-Non-HIV	ORGANISM	MARI-HIV	MARI-Non-HIV
1	*Escherichia coli*	0.3	0.5	*Klebsiella* sp	0.8	0.4	*Staphylococcus* sp	0.3	0.5
2	*Escherichia coli*	0.5	0.5	*Klebsiella* sp	0.6	0.5	*Staphylococcus* sp	0.3	0.3
3	*Escherichia coli*	0.3	0.4	*Klebsiella* sp	0.4	0.4	*Staphylococcus* sp	0.2	0.3
4	*Escherichia coli*	0.5	0.4	*Klebsiella* sp	0.4	0.4	*Staphylococcus* sp	0.2	0.2
5	*Escherichia coli*	0.5	0.4	*Klebsiella* sp	0.3	0.4	*Staphylococcus* sp	0.5	0.3
6	*Escherichia coli*	0.3	0.3	*Klebsiella* sp	0.6	0.7	*Staphylococcus* sp	0.3	0.3
7	*Escherichia coli*	0.6	0.4	*Klebsiella* sp	0.4	0.5	*Staphylococcus* sp	0.2	-
8	*Escherichia coli*	0.3	0.5	*Klebsiella* sp	0.5	-	*Staphylococcus* sp	0.3	-
9	*Escherichia coli*	0.5	0.4	*Klebsiella* sp	0.5	-	*Staphylococcus* sp	0.2	-
10	*Escherichia coli*	0.5	0.3	*Klebsiella* sp	0.4	-	*Staphylococcus* sp	0	-
11	*Escherichia coli*	0.5	0.1	*Klebsiella* sp	0.3	-	*Staphylococcus* sp	0.2	-

12	*Escherichia coli*	0.3	0.2	*Klebsiella* sp	0.3	-	*Staphylococcus* sp	0.2	-
13	*Escherichia coli*	0.3	0.7	*Klebsiella* sp	0.5	-	*Staphylococcus* sp	0	-
14	*Escherichia coli*	0.5	0.3	*Klebsiella* sp	0.5	-	*Staphylococcus* sp	0.5	-
15	*Escherichia coli*	0.5	0	*Klebsiella* sp	0.4	-	*Staphylococcus* sp	0.2	-
16	*Escherichia coli*	0.5	0.2	*Klebsiella* sp	0	-	*Staphylococcus* sp	0	-
17	*Escherichia coli*	0.4	0.4		6.9 Ave= 0.43	3.3 Ave=0.47	*Staphylococcus* sp	0.5	-
18	*Escherichia coli*	0.4	0.5	*Proteus* sp	0.3		*Staphylococcus* sp	0	-
19	*Escherichia coli*	0.4	0.2	*Proteus* sp	0.4		*Staphylococcus* sp	0.2	-
20	*Escherichia coli*	0.4	0.2	*Proteus* sp	0.3			4.3 Ave.= 0.23	1.9 Ave=0.32
21	*Escherichia coli*	0.3	-	*Proteus* sp	0.3				
22	*Escherichia coli*	0.2	-						
23	*Escherichia coli*	0.7	-	*Pseudomonas* sp	0.5				
24	*Escherichia coli*	0.4	-		0.5 Av=0.50				
25	*Escherichia coli*	0	-						
26	*Escherichia coli*	0.3	-						
27	*Escherichia coli*	0.3	-						
28	*Escherichia coli*	0.4	-						
		6.9 Ave= 0.35	11.1 Ave= 0.40						

DISCUSSION

Amongst other infections predominant in people living with HIV, UTI seem to be one of the major causes of morbidity. In this study, uropathogens; *Escherichia coli*, *Klebsiella*, *Staphylococcus*, *Proteus*, and *Pseudomonas* species were isolated from HIV- infected and HIV-negative patients. These uropathogenic bacteria have also been isolated by Zakari *et al*.[2]and Oluwafemi *et al*.[5]among HIV-infected individuals attending Anti-retroviral therapy (ART) clinic in Jos, Nigeria. The high incidence of *Escherichia coli* (41.18%), followed by *Staphylococcus* (27.94%) and *Klebsiella* species (23.53) among the HIV patients when compared with the non-HIV patients in this study is similar with the studies of Zakari *et al*.[2] and Nabbugodi *et al*.[10] Zakari *et al*.[2]reported prevalence frequencies of 30.77%, 25.08% and 10.26% for *Escherichia coli*, *Staphylococcus* and *Klebsiella* species respectively among HIV-positive patients attending Hospitals in Jos, Nigeria while Nabbugodi *et al.*[10]who worked on the prevalence of UTI among antenatal women presented with lower abdominal pains at National Hospital in Kenya reported prevalence frequencies of 30.77%, 25% and 12.26% for *Escherichia coli*, *Staphylococcus* spp, and *Klebsiella* species respectively. Possible reasons for this high predominance of these bacteria especially *Escherichia coli* and *Staphylococcus* species may be due to poor personal hygiene and other issue relating to the proximity of peri-urethra area and the anus where faecal flora originate mostly. *Staphylococcus* species being the normal flora of the skin also has high tendency of causing infections most importantly in both sexually active men and women.[11]The high frequency distribution of uropathogenic bacteria among females [45 (78.95%)] than males [23 (53.49%)] with HIV agrees with earlier studies.[12-15] Furthermore, the high predominance of uropathogens amongst HIV-infected individuals than HIV-negative individuals in this study is also similar to the studies of Zakari*et al*.[2]The closeness of the female urethral meatus to the anus, shorter urethra, sexual intercourse, and poor hygiene (bad toilet habits) may likely be the major factors that boost the higher prevalence of UTI in females than males.[16] The high frequency of UTI amongst HIV patients between the age of 31-35 years [24(35.29 %] and 26-30 years [17 (25.00 %)] and zero occurrence of UTI among HIV patients within age groups<25, 61-65 and >65years aligned with the studies of Oluwafemi *et al*.[5] but varied with the studies of Zakari *et al*.[2] who reported high prevalence (33%) at 20-24 age group in their study. The differences in the prevalence of infection observed among the various age groups may be attributed to the mode of exposure to HIV which is a paramount predisposing factor. The high susceptibility of uropathogens, especially the Gram-negative bacteria, such as *Klebsiella* species, *Pseudomonas* species, *Escherichia coli*, and *Proteus* species to ertapenem, cefepime, ofloxacin, nalidixic acid, gentamycin, and amoxicillin/tazobactam among the bacterial isolates from

urine samples of HIV patients invariably suggests the low level of abuse of these antibiotics; and their efficacies further makes them potential therapeutic options in this population. However, other studies[17, 18, 19] on the same subject reported high susceptibility of uropathogens to nalidixic acid, ofloxacin, and sulphamethoxazole/ trimethoprim which showed high resistance touropathogens in our study. Of note, when relating these current findings to the previous study on the same background, there has been a rise in the resistance trends to antibiotics especially trimethoprim-sulfamethoxazole as Masinde*et al*.[20] reported 64.7% resistance and now 89.26% in this study. The high Multiple Antibiotic Resistance Index (MARI) values of uropathogensin this study, especially *Pseudomonas* species(0.50), *Klebsiella* species (0.43), and *Staphylococcus* species(0.23) amongst other isolates from urine samples of HIV-positive patients implies that *Pseudomonas* species, *Klebsiella* species and *Staphylococcus* species are no longer responding to the effect of 50 %, 43 %, and 23 % respectively of all the antibiotics used in their treatment. *E.coli* commonly reported in other studies had MARI of 0.40 which also indicate that *E. coli* is no longer sensitive to over 40% of antibiotics used in its treatment among HIV patients. The MARI observed in this study is far lower than 0.9 reported by Iroha *et al*.[21]This is relatively disturbing, even though, many factors may be implicated to the emergency of Uropathogens in both HIV positive and negative patients among which include; over recommending of antibiotics by medical practitioners, excessive and inadequate usage of antibiotics by patients. Hence, the accessibility of the antibiotics needs not to be ignored in Nigeria. Moreover, the high MARI of HIV positive over HIV negative patient in this study is a possible indication that a HIV positive patient may have been exposed to several and uncontrolled antibiotics.

CONCLUSION

In conclusion, the result of this study showed that the most prevalent uropathogens in both HIV-positive and HIV-Negative patients were *E.coli*, *Staphylococcus*, and *Psuedomonas* species; and they are mostly dominant in 31-35 age group. Most of the uropthogens in both samples were highly susceptible toertapenem, cefepime, amoxicillin/tazobactam, and ofloxacin but highly resistant to sulphamethoxazole/trimethoprim with *Pseudomonas* species having the highest MARI value(0.50). Hence, it is pertinent that monitoring of antimicrobial resistance be routinely performed and should include control options such as judicious use of antimicrobials in the treatment of UTI so as to avoid/curtail the spread of resistance in community and hospital settings.

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