Prevalence of Urinary Tract Infection in HIV Patients on Antiretroviral Drugs in Jos Metropolis, Nigeria

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Abstract: Prevalence of UTI in HIV patients is well documented in several studies across the world, but there is paucity of data as regards UTI in HIV patients in Jos metropolis, Nigeria. The study was designed to determine the prevalence of urinary tract infection in HIV positive patients in Jos metropolis and their antibiotic susceptibility pattern. Two hundred and twenty-five mid-stream urine samples were obtained from HIV patients. Samples were cultured on cysteine lactose electrolyte deficient (CLED) agar and blood agar. Gram staining and biochemical tests were carried out to identify the bacteria isolates. Sensitivity testing was performed on isolates using disc diffusion method. Of the 225 HIV patients tested, 13(5.8%) were positive for UTI of which males had 5(4.8%) while the females had 8(6.6%). The study showed the presence of UTI in all age groups with the exception of age group ≥46yrs. The low prevalence of urinary tract infection recorded in the present study is an indication of the efficacy of prophylaxis administered to HIV patients to prevent opportunistic infection.

Keywords: Urinary Tract Infection, HIV, Prevalence, Antibiotic Sensitivity Pattern, Inoculum, Gram Staining

1. Introduction

Urinary tract infection is one of the most common bacterial infections and the cause of morbidity and hospitalization in HIV positive individuals. Urinary tract infection is responsible for approximately 60.0% of opportunistic infections associated with AIDS. This represents a considerable health problem amongst HIV infected patients [1]. Several studies have shown that the prevalence and risk of urinary tract infection (UTI) among HIV infected patients may be significantly high in HIV infected patients mainly with CD4 cell counts < 200 cells/ μL [2].

UTIs may be seen as complicated or uncomplicated [3]. A complicated UTI is that which occurs in a patient with an abnormal anatomical urinary tract [4], while uncomplicated UTI refers to the occurrence of bacterial infection in patients with normal structural and functional urinary tract [5].

Recent studies have demonstrated a broad range of microorganisms causing UTIs in HIV-infected patients, namely *Escherichia. coli, Proteus spp, Enterobacter spp, Klebsiella spp, Pseudomonas aeruginosa*, *Enterococcus faecalis*, *Staphylococcus aureus* and rarely *Candida spp., Salmonella spp., Acinetobacter spp.,* and Cytomegalovirus. [2]. Almost all the causative organisms of bacterial UTIs originate from faecal materials or the periurethral environment [6].

Varieties of antibiotics are available for the treatment of UTI. The choice of antibiotic depends on the severity of infection. The emergence of antibiotic resistance has posed a serious problem in the management of UTIs. However, such resistance may be due to extensive use and misuse of antimicrobial drugs which is a common norm in the management of UTIs [7, 8].

The prevalence of UTI among HIV patients is well documented in several studies across the world including

Nigeria, but there is paucity of data as regards UTI in HIV patients in Jos metropolis. This study was set out to determine the prevalence of urinary tract infection among HIV positive individuals.

2. Materials and Methods

2.1. Study Area

The study was carried out in AIDS Prevention Initiative Nigeria (APIN) and Faith Alive Foundation located in Jos metropolis. Jos covers an area of 26,890 km^2, and is located in the Middle Belt zone. Based on the 2006 population census figures, Jos had an estimated population of 900,000 residents. Jos has an elevation of 1,238 meters high above sea level [2].

2.2. Study Population

The study population included HIV positive males and females of all age groups on antiretroviral drugs attending AIDS Prevention Initiative Nigeria (APIN) and Faith Alive Foundation.

2.3. Sample Size

The sample size was determined using the equation for sample size according to Thrusfield [9].

2.4. Ethical Consideration

The ethical clearance for this research was sought and obtained from the ethical clearance committees of Jos University Teaching Hospital and Faith Alive Foundation before the commencement of the study. A written consent was obtained from subjects before collection of samples.

2.5. Data Collection

Information regarding patients age, sex, marital status, and occupation were obtained using a structured questionnaire.

2.6. Specimen Collection

Mid-Stream urine specimens were collected from 225 study participants in sterile screw capped labeled universal bottle. These were transported immediately on ice packs in a cooler to the Department of Medical Laboratory Science, University of Jos for processing.

2.7. Sample Processing and Culture

A Loop full of well mixed uncentrifuged urine was streak inoculated on the surface of blood agar and Cysteine Lactose Electrolyte Deficient (CLED) agar. The plates were incubated aerobically at 37°C for 24 hours after which the growth on the culture plates were examined by their colonial morphology and Gram staining. The isolates were further identified using the following biochemical tests: Indole test, citrate utilization test, oxidase test, urease test, catalase test and coagulase test.

2.8. Antibiotic Susceptibility Testing

Antibiotic susceptibility testing was performed by disc diffusion method. Pure colonies from culture plates were suspended in a sterile normal saline and were agitated to achieve a homogenous suspension. The suspension density was adjusted to 0.5 McFarland's standard [10]. The standardized inoculum was inoculated on the dried surface of Mueller Hinton agar plate using a sterile cotton swab and the surface of the plate was allowed to dry. Using a sterile forceps, the antibiotic impregnated discs were placed on the surface of the agar plate and were incubated aerobically at 37°C for 24hrs. After overnight incubation, the zone diameters were measured and the results were noted according to Clinical and Laboratory Standards institute [11] interpretative break point.

The antibiotic agents used in this study includes; ciprofloxacin (10µg), gentamicin (10µg), erythromycin (30µg), levofloxacin (20µg), chloramphenicol (30µg), ampiclox (20µg), streptomycin (30µg), amoxicillin (20µg), norfloxacin (10µg), rifampicin (20µg).

2.9. Data Analysis

The statistical analysis was done using statistical package for social sciences (SPSS) Version 21. The statistical significance was considered at $p < 0.05$.

3. Results

Out of the 225 urine specimens examined, 13 (5.8%) were positive for UTI. Females had the highest occurrence of UTI 8(6.6%) compared to the male counterparts 5(4.8%) as shown in Table 1. The age group 16-30years recorded the highest prevalence of UTI 3(8.1%), followed by ≤15years with 1(7.7%) and 31-45years age group had the least occurrence 9(6.9%) and regarding marital status, the highest prevalence was observed among the singles 4 (6.6%), while the married had a prevalence of 9(5.8%) as shown in Table 1. The prevalence of UTI in relation to occupation indicated that the unemployed had the highest prevalence of 3(9.1%), followed by business owners 8(7.0%) and civil servants 2(3.2%) as shown in Table 1.

Table 2: The antibiotic sensitivity pattern of bacteria isolates indicates that Levofloxacin 11(84.6%) exhibit the highest activity against bacteria isolates, and *Escherichia coli* showed the highest sensitivity to Levofloxacin 5(100%). The distribution of uropathogens from urine specimens of HIV positive patients revealed *Escherichia coli* as the most prevalent uropathogens 5(38.5%), followed by *Staphylococcus aureus* 3(23.1%), *Klebsiella species* 3(23.1%), while the least occurring pathogens were *Proteus species and Pseudomonas aeruginosa* had 1(7.7%) as shown in Figure 1.

***Table 1.** Demographic characteristics of patients examined.*

Demographic variables	Frequency n=225	No. positive (%)	P-value
Gender			
Male	104	5(4.8)	0.563
Female	121	8(6.6)	
Age (years)			
≤15	13	1(7.7)	0.314
16-30	37	3(8.1)	
31-45	131	9(6.9)	
≥46	44	0(0.0)	
Marital status			
Single	61	4(6.6)	0.760
Married	164	9(5.5)	
Occupation			
Civil servants	62	2(3.2)	0.454
Farmer	15	0(0.0)	
Business	115	8(7.0)	
None	33	3 (9.1)	

***Table 2.** Antibiotic sensitivity pattern of bacteria isolates from urine specimens of HIV positive patients attending APIN and Faith Alive foundation in Jos.*

Bacteria isolates	No isolated	AMX	NB	S	CH	CPX	E	LEV	CN	APX	RD
E. coli	5	2(40.0)	1(20.0)	1(20.0)	3(60.0)	3(60.0)	2(40.0)	5(100.0)	2(40.0)	4(80.0)	3(60.0)
S. aureus	30 (0.0)	0(0.0)	1(33.3)	1(33.3)	1(33.3)	2(66.7)	2(66.7)	3(100.0)	2(66.7)	0(0.0)	
Klebsiella spp	3	0(0.0)	0(0.0)	2(66.7)	2(66.7)	3(100.0)	3(100.0)	2(66.7)	1(33.3)	1(33.3)	0(0.0)
P. aeruginosa 1	0(0.0)	1(100.0)	1(100.0)	0(0.0)	0(0.0)	0(0.0)	1(100.0)	0(0.0)	0(0.0)	0(0.0)	
Proteus spp.10(0.0)	0(0.0)	1(100.0)	0(0.0)	1(100.0)	0(0.0)	1(100.0)	1(100.0)	0(0.0)	0(0.0)		
Total	13 2(15.4)	2(15.4)	6(46.2)	6(46.2)	8(61.5)	7(53.8)	11(84.6)	7(53.8)	7(53.8)	3(23.1)	

Key: AMX- Amoxicillin, NB-Norfloxacin, S-Streptomycin, CH-Chloramphenicol, CPX-Ciprofloxacin, E-Erythromycin, LEV-Levofloxacin, CN-Gentamicin, APX-Ampiclox, RD-Rifampicin
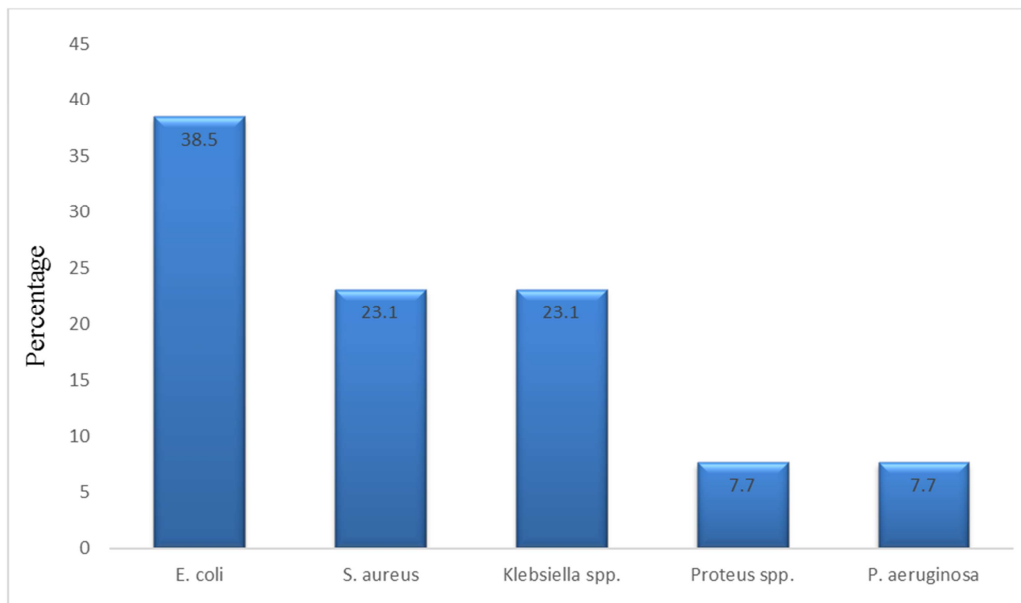

***Figure 1.** Distribution of bacteria isolates from specimens of HIV positive patients attending APIN and Faith Alive foundation in Jos.*

4. Discussion

The study revealed 5.8% prevalence of uropathogens in tandem with results of similar study obtained elsewhere [2, 12-13]. There have been several studies on this subject and it is expected that the stakeholders involved in management of HIV positive individuals have utilized the result emanating from previous study, hence the low prevalence observed in this study. It may also be as result of the routine use of cotrimoxazole as a prophylaxis for the prevention of opportunistic infection among HIV positive individuals.

This study also observed that the prevalence of UTI in females 6.6% was higher compared to 4.8% in males, the reason for this higher prevalence observed in females could be attributed to any of the following; proximity of female genitalia to the anal region, the short and wider urethra of females and sexual intercourse [1, 14-16].

There was no statistical significant difference in the

occurrence of UTI in relation gender (P=0.563), age group (P=0.314), marital status (P=0.760) and occupation (P=0.454) of individual examined, and this is contrary to observations by Kanu*et al.* [17] but it agrees with UTI study carried out by Essien *et al.*[18].

Escherichia coli was the most predominant pathogen with a prevalence of 38.5%. This is in line with similar reports from previous studies [1, 12, 18-20].

In terms of sensitivity pattern, Levofloxacin (84.6%) had the highest overall sensitivity followed by Ciprofloxacin (61.5%), while the least sensitivity was shown by Amoxicillin (15.4%), and Norfloxacin (15.4%). The variation in sensitivity pattern of the isolates might be due to the irrational prophylactic usage and an inappropriate dosing schedule.

5. Conclusion

The 5.8% prevalence in this study has established that UTI is present in HIV positive patients. *Escherichia coli* were the most prevalent uropathogens isolated. Levofloxacin showed the highest activity against bacteria isolates tested. There is no gain saying that our finding has added to the already existing information on UTI in HIV positive patients in Jos, Nigeria.

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