# Incidence of Urinary Tract Infections in HIV-seropositive and HIV-seronegative females in Port Harcourt, Rivers state, Nigeria

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**ABSTRACT:** The impact of human immunodeficiency virus (HIV) on the prevalence of Urinary Tract Infection (UTI) was studied. This study was carried out to determine the prevalence of UTI among HIV-positive females and HIV-negative females. Clean catch midstream urine was collected from 100 subjects comprising 50 HIV-positive females and 50 HIV-negative females. The HIV-positive females consisted of 20 highly active retroviral therapy (HAART) – naïve females and 30 subjects on HAART for three to six months. Most of the HIV-positive females had no signs or symptoms of UTI compared to HIV-negative females. Microbial isolates were identified in urine and susceptibility tests were performed. Only HIV-positive females on HAART had significantly higher prevalence of UTI compared to HIV-negative females. Of the organisms isolated, *Staphylococcus aureus* (24.5%) was most predominant. This was followed by *Escherichia coli* (18.4%), *Pseudomonas aeruginosa* (18.4%), *Klebsiella pneumoniae* (14.3%), *Proteus* sp (6.1%), *Enterococcus feacalis* (6.1%), *Streptococcus* sp (6.1%), and *Staphylococcus epidermidis* (6.1%). The antibiograms showed Gram-negative bacteria (GNB) had the highest percentage resistance to ampicillin, septrin and nalidixic acid. GNB also has highest susceptibility to Tarivid, ceporex and peflacine while the Gram positive bacteria (GPB) showed highest resistance to nrobactin and fleocapen. GPB showed highest susceptibility to ciprofloxacin, augumentin, and gentamycin. The antibiograms showed presence of multi-drug resistance (MDR) organisms. This study however further confirmed the presence of HIV and UTI coinfections in Port Harcourt, Nigeria. This calls for the need for an extensive HIV awareness programmes. General surveillance and public health education to stop the spread of the infection from this group is advocated.
This study showed a higher prevalence of bacterial uropathogens among the HIV/AIDS patients as compared to other findings on HIV negative patients. The antibiogram showed that the antibiotics of choice were Gentamicin, Nitrofurantoin and Augmentin.
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**Keywords:** Antibiograms, Coinfections, Gram-positive bacteria, Gram-negative bacteria, HIV, HAART

## 1. INTRODUCTION

The advent of HIV/AIDS has resulted in many microbial agents becoming opportunistic infections among individuals whose immune status has been suppressed by the infection (**Bigwan** and Wakjissa, 2013). Bacterial infections are a common cause of morbidity and mortality in HIV positive individuals (Evans et al., 1995). HIV-positive patients are liable to acquire opportunistic infections including urinary tract infections (UTIs) (Schönwald et al., 1999). UTI is not only common nosocomial infection but an important source of morbidity in community as well (Sharma, 1997; Acharya et al., 2011; Jai et al., 2012). It is the most frequent cause of illness in humans after respiratory tract infection (Liperky, 1989; Jai et al., 2012).

UTI is the most common problem found in all age group patients. UTI has more prevalence in HIV-infected patients because of decreased immune status compared to Non-HIV infected individuals. Recent reports suggest that the incidence of urinary tract infection (UTI) is increased in HIV positive patients (Omar de Rosa et al., 1990; Pinho et al., 1991; Evans et al., 1995). Furthermore, there is evidence that bacteriuria is more common as HIV disease progresses (Hoepelman et al., 1992; Bain et al., 1992; Evans et al., 1995). Co-trimoxazole is active against most common urinary pathogens and has been widely used as prophylaxis against Pneumocystis carinii pneumonia (PCP) in immunocompromised individuals (CDC, 1992; Evans et al., 1995).

This study is aimed to determine the incidence of UTI in a cohort of HIV-positive females in Port Harcourt, Nigeria and to assess whether the incidence of UTIs varied among HIV positive and HIV negative females. The study also assesses the susceptibility profile of uropathogens to different antibiotics.

## 2. MATERIALS AND METHOD

### 2.1. Study Population

This study was carried out at the University of Port Harcourt Teaching Hospital (UPTH), Port Harcourt City, Nigeria. A total of 100 subjects were

studied consisting 50 HIV-positives females and 50 apparently healthy HIV-negative individuals. The HIV-positive females consisted of 30 patients on highly active antiretroviral therapy (HAART) for 3-6 months. Exclusion criteria include antibiotic usage within one week and large fluid in-take (in previous hour) before clinic attendance. The HAART, regimen for HIV patients on HAART consisted of zidovudine, stavudine and nevirapine. Verbal informed consent was obtained from all subjects before specimen collection.

**2.2. Sample collection and processing**

Clean-catch mid-stream urine and 5ml of venous blood was collected from each subject. Urine specimens were collected into a sterile screw –capped universal container containing a few crystals of boric acid as preservative.

**2.3. Culturing, Isolation and identification of isolates**

Samples were examined and processed on the blood agar, cystine lactose electrolyte deficient (CLED) agar and McConkey's medium by standard loop method and incubated for at least 24 hours at $37^0$C. Plates were observed for bacterial growth. Culture results were interpreted as significant and insignificant according to standard i.e. a growth of $\geq 10^5$ CFU/ml was labelled as significant bacteriuria.

**2.4. Antibiotics sensitivity test**

Antibiotic susceptibility test of antibiotics and their interpretation was carried out for bacterial isolates by Kirby-Baur technique as recommended by National Committee for Clinical Laboratory Standards (2000). Uropathogens were identified on the basis of Gram's reaction, colony morphology and standard biochemical tests. Antibiotic susceptibility was tested by disc diffusion method for all 1st and 2nd line antibiotics. First line antibiotics tested were Ampicillin, Augumentin, Co-trimoxazole (Septrin), Gentamicin, Nalidixic acid, Penicillin and Streptomycin. Second line antibiotics tested were Ceporex, Ofloxacin, Peflacine and Ciproflox.

**2.5. Data Analysis**

SPSS 20.0 for Windows statistical package was employed in the analysis of the data generated. The normal distribution was tested by the kolmogororsmirnov test. The chi-square was used to test for goodness of fit. An error probability (P value) $<0.05$ was considered significant.

**3. RESULTS**

**3.1. Prevalence of Significant Bacteria in the HIV-Positive Females**

An analytical study of 100 rand samples of urine collected from 50 HIV positive female and 50 non HIV female was carried out at the University of Port Harcourt Teaching Hospital (UTPH) were evaluated to assess the prevalence of Urinary Tract Infection (UTI) in Human Immunodeficiency Virus (HIV) positive female and non HIV female with the age of 25-50. Among these 17 out of the fifty showed significant bacteruria ($> 10^5$ organisms/ml) representing 34% of the samples studied, 14 showed no significant bacteruria growth (microorganism less than $10^5$ per ml) representing 28% of the studied, while 19 samples showed no bacteruria growth representing 38% of the samples studied (Table 1).

**Table 1: Prevalence of Significant Bacteriruria in HIV female and Non HIV Female**

| Bacterial Growth | Number HIV Female | % Occurrence HIV Female | Number Non HIV Female | % Occurrence Non HIV Female |
|---|---|---|---|---|
| S.B.G | 17 | 34 | 20 | 42 |
| N.S.B.G | 14 | 28 | 10 | 20 |
| N.B.G | 19 | 38 | 20 | 38 |
| Total | 50 | 100 | 50 | 100 |

**Key:**
S.B. G: Significant bacterial growth; N.S.N.G: Non significant bacterial growth;
N.B.G: No bacterial growth

**3.2. Prevalence of Significant Bacteria in the HIV-Negative Females**

Then among the fifty (50) non HIV female studied 21 showed significant bacteruria ($> 10^5$ organism)/ml) representing 42% of the samples studied 10 samples showed no significant bacteruria (microorganism less than $10^5$ per/ml) representing 20% of the samples studied of the sampled studied which 19 had no bacterial growth representing 38% of the samples studied (Table 1). *Staphylococcus aureus* was shown to be the prevalence organism causing the UTI in 12 subjects, followed by *E.coil* in subjects, *Pseudomonas Sp* in 9 subjects, *Klebsiella Sp* in 7 subjects, *Proteus Sp* in 3 subject, *Enterococcus feacalis* in 3 subjects, *Streptococcus Sp* is 3 and *Staphylococcus Epidermidis* is 3 which are the least prevalent.

**3.3. Frequency Occurrence of isolates**

Various biochemical tests were used in identifying the isolated microorganisms. Coaglulase and catalase tests was used in differentiating *Staphylococcus Sp* from *Streptococcus Sp,* Catalase test-was used in identifying

*Staphylococcus Sp* from *Streptococcus Sp* as well as a number of other microorganisms while coaglase test was used to identify *Staphylococcus aurerus* from *Staphylococcus epidermids*. Indole, urease, oxidase, catalase, glrate was used in identifying gram negative no rods, white hydrogen sulphide, Acid gas, voges proskau and methyl red was used for the breakdown of their metabolic products. The sugar fermentation tests and also the triple sugar fermentation tests were used to detect some of the organism's ability to ferment certain carbohydrates such as glucose, sucrose, maltose, and lactose. *Staphylococcus aureus* had a frequency of 12, *Staphylococcus epidermides* had 3, *E.coil* had 9, *Pseudomonas Sp* had 9, *Klebsiella Sp* 7, *Proteus Sp* has 3, *Enterococcus Fecalis* has 3 and *Streptococcus Sp* 3.

**Table 2: Frequency Occurrence of isolates**

| **Organisms Isolated** | **No** | **Percentage** |
|---|---|---|
| *Staphylococcus aureus* | 12 | 24.5% |
| *Staphylococcus epidemidis* | 3 | 6.1% |
| *E. coil* | 9 | 18.4% |
| *Pseudomonas sp* | 9 | 18.4% |
| *Klebsiella sp* | 9 | 14.3% |
| *Proteus sp* | 3 | 6.1% |
| *Streptococcus sp* | 3 | 6.1% |
| *Enterococcus fecalis* | 3 | 6.1% |
| **Total** | **49** | **100** |

### 3.4. Antibiotics Sensitivity patterns of Gram negative isolates

The Gram negative isolates showed highest resistance to ampicillin, septrin, nalidixic acid highest susceptibility to Tarivid, ceporex and peflacine, whuile the gram positive isolates showed heist resistance to nrobactin and fleocapen with highest sensitivity to ciprofloxacin, Augumentin, and Gentamycin. The results are shown below in Table 3.

**Table 3: Antibiotic sensitivity patterns of Gram negative isolates**

| **Gram-ve isolates** | **OFX** | **CEP** | **CN** | **AU** | **NA** | **CPX** | **S** | **PEF** | **SXT** | **PN** |
|---|---|---|---|---|---|---|---|---|---|---|
| *P. aeruginosa* | S | S | R | S | R | S | R | S | R | R |
| *Klebsiella sp* | S | S | R | S | R | S | R | R | R | S |
| *Klebsiella sp* | S | D | R | S | R | S | S | S | R | R |
| *E. coil* | S | S | S | R | R | S | S | S | R | R |
| *Klebsiella sp* | S | R | S | S | R | S | S | R | S | S |
| *Proteus sp* | R | S | S | R | R | S | R | S | S | R |
| *P. aeruginosa* | S | S | R | S | S | R | S | S | R | S |
| *E. coil* | SS | S | R | S | R | S | S | S | R | S |
| *Proteus sp* | R | R | R | S | R | S | S | S | R | R |
| *Klebsiella sp* | S | R | S | S | R | S | R | R | R | S |
| *E. coli* | S | S | S | R | S | S | S | S | R | S |
| *Klebsiella sp* | S | S | R | S | R | S | S | S | R | S |
| *P. aeruginosa* | S | S | R | S | R | S | R | R | R | R |
| *Klebsiella sp* | S | R | S | R | R | S | S | S | R | S |
| *P. aeruginosa* | S | R | S | S | R | R | R | R | R | R |
| *E. coli* | S | S | S | S | R | S | S | S | R | R |
| *E. coli* | S | R | S | R | R | S | S | S | R | R |
| *Klebsiella sp* | S | S | S | R | R | S | S | S | R | S |
| *P. aeruginosa* | S | R | R | R | R | R | R | S | S | R |
| *E. coli* | S | R | S | R | R | S | S | S | R | R |

Keys: OFD – Tarivid, PEF – Peflacine, CPX – Ciprofloxacin, AU- Augmentin, CN- Gentamycin, CEP-Ceprox, S-Streptomycin, AN-Nalidixic – acid, SXT – Septrin, PN- Ampicillin, R. Resitance, S: Sensitive.

### 3.4. Antibiotics Sensitivity patterns of Gram Positive isolates

The Gram positive isolates showed highest resistance to ampicillin, septrin, nalidixic acid highest susceptibility to Tarivid, ceporex and peflacine, whuile the gram positive isolates showed heist resistance to nrobactin and fleocapen with highest sensitivity to ciprofloxacin, Augumentin, and Gentamycin. The results are shown below in Table 4.

**Table 4: Antibiotic sensitivity patterns of Gram positive isolates**

| Gram Positive isolates | CH | CPX | E | LC | CN | APX | RD | TLX | S | NB |
|---|---|---|---|---|---|---|---|---|---|---|
| *Staphylococcus aureus* | R | S | R | S | R | R | S | R | S | R |
| *Staphylococcus aureus* | R | R | S | S | R | S | S | R | S | R |
| *Staphylococcus aureus* | S | S | S | S | R | S | S | S | S | S |
| *Staphylococcus aureus* | S | S | S | S | S | S | R | R | R | S |
| *Staphylococcus aureus* | R | S | S | S | S | S | S | S | S | S |
| *Staphylococcus aureus* | R | S | R | R | S | R | R | R | S | R |
| *Enterococcus faecalis* | R | S | R | R | S | R | R | R | S | R |
| *Staphylococcus aureus* | S | S | R | S | S | S | S | S | R | S |
| *Enterococcus faecalis* | R | S | R | S | R | R | S | R | R | R |
| *Staphylococcus aureus* | R | S | R | R | S | R | R | R | S | R |
| *Staphylococcus aureus* | R | S | S | S | S | R | S | R | R | R |
| *Staphylococcus aureus* | R | S | R | R | R | R | S | R | R | R |
| *Staphylococcus sp* | R | S | S | R | S | S | R | R | R | R |

Keys: RD – R.fampim, FLX – Floxapen, E- Enythromycin, CH – Chloramphenicol, APX – Ampiclox, CPX – Ciprofloxacin, LC – Lincocin, S. Streptomycin, R. Resistance, and S. Sensitive. Zone size interpretation: < 2.5 Resistance, > 2.5: sensitive.

## 4. DISCUSSION

People with HIV are predisposed to Urinary Tract Infections by common bacteria and pathogen, these pathogens may affect any urologic organs and treatment therefore, should be culture specific and long-term voiding dysfunction in patients with HIV is usually a result of opportunistic Infections. Most infectious complications in people with HIV are due to opportunistic pathogens. Nevertheless, Infections caused by common bacterial pathogens may represent additional causes of morbidity and mortality for HIV infected individuals (Gracia Leoni et al, 1992).

This study was conducted to determine the prevalence of Urinary Tract Infection in HIV-positive female attending Anti-retroviral clinic of the University of Port Harcourt Teaching Hospital (UPTH) and comparing this prevalence with non HIIV healthy control female. The organism were isolated from urine with an overall prevalence 62% in the HIV female patients compared to 60% in the HIV females than in non HIV healthy control females. This result is consistent with the findings of other works and attributed to the female urethra being short and close to the anal opening predisposed her to Infections by which can easily contaminated the urethral opening from one's anus (Schaeffer 1987; Nester, et al, 1998).

Some of the urine samples did not show significant bacterial growth, this was due to the fact that the number of organisms seen was not large enough to be regarded as significant growth. In this case, *E.coli* still stands as the most common organism causing Urinary Tract Infection which occurred in 15% of the patients, *Staphylococcus aureus* in 10% patients, *candida Sp* in 10 subjects, Klebsiella Sp in 8% with the least prevalence with *Proteus Sp* 3 subjects and *Enterococcus, faecalis* in 3 subjects, white 2 of the subjects had *pseudomonas* Infections. The low frequency of *pseudomonas Sp* may be due to their long mean generation time of fifty minutes and also inability to withstand the physiochemical condition of the urethral environment (Mulhlland, 1978). Of particular importance is the sensitivity patterns of the strains of bacteria isolated, the effective medication recommended would be ciprofloxacin, peflacine and tarivid.

## 5. CONCLUSION

The study shows that Urinary Tract Infections remain among the most common reasons for outpatients to seek medical care and for inpatients to develop nosocomial Infections (Stamm et al., 1993). Most HIV patients take prophylactic antimicrobials for opportunistic Infections causing pneumonia or diarrhea, the potentially for life-threatening complications exists, and rapid diagnosis and appropriate therapy are essential in minimizing the

risk. Causative organisms usually originate from the gastrointestinal Tract and colonize the distal urethra before gaining entry into the bladder and higher Urinary Tract structures. The clinical presentation, together with the results of diagnostic studies including urinalysis and urine culture, helps to guide therapeutic decision making. The antimicrobial choice for treatment of a UTI must be considered. The cost potentials side effects and toxicity along with the spectrum of activity. The continuous bladder catheterization is not always the best approach for bladder hygiene and promotes the development of Urinary Tract colonization and Infection (Patton, 1991). Therefore, HIV infected female should not just be treated with broad spectrum antibiotics for symptoms and suspected urine Infection, but rather should be treated with antibiotics that showed that Ciprofloxacin Peflacine, Tarovid, Ceporex, Augumetin were the most effective.

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