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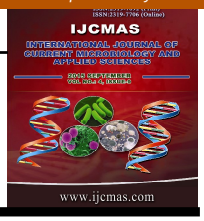


**Original Research Article**

# Prevalence and Predictors of Asymptomatic Urinary Tract Infection among HIV Positive Patients in Jos, North Central Nigeria

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**A B S T R A C T**

Asymptomatic urinary tract infection refers to infection of the urinary tract without any declared symptom. This study is aimed at determining the prevalence, etiology and antimicrobial susceptibility pattern of isolates among HIV positive individuals. Demographic data were collected using a well designed questionnaire and 389 HIV positive individuals without signs and symptoms of urinary tract infection (UTI) were recruited for the study. Urine specimens were obtained for urinalysis, microscopy, culture and antimicrobial sensitivity testing. Out of the 389 individuals screened 75 (19.3%) had UTI. Urine dipstick positive for nitrite, leucocyte esterase and blood were noted to be predictors while individuals with pus cells in urine were prone to UTI. Isolated organisms included *Escherichia coli* 36 (48.0%), *Klebsiella spps.* 2(2.6%), *Staphylococcus aureus* 17 (22.6%), *Pseudomonas aeruginosa* 4 (5.3%), *Proteus mirabilis* 8 (10.6%) and *Candida albicans* 8 (10.6%). However, we observed high resistance of the isolates to ampicillin 8/67 (11.9%), nitrofurantoin 25/67 (37.3%) and augmentin 31/67 (46.3%). Ciprofloxacin had the least resistance 61/67 (91.0%) from the isolated pathogens.

**Keywords**

Urinary tract infection, Isolates, Antimicrobial sensitivity

## Introduction

Asymptomatic urinary tract infection is the isolation of a specified quantitative count of bacteria in an appropriately collected urine specimen obtained from a person without symptoms or signs referable to urinary infection (Rubin *et al.*, 1992). On the other hand urinary tract infection (UTI) is a term used to describe a variety of clinical conditions ranging from asymptomatic (presence of bacteria in the urine without any declared signs or symptoms) to severe infection of the kidney (Tanagho and Jack, 2004).

UTI is prevalent in patients with Human Immunodeficiency Virus (HIV) when compared to those without HIV (Evans *et al.*, 1995), also people living with (HIV) are likely to be more predisposed to urinary tract infections due to the suppression of

their immunity (Bakke and Diagranes, 1991; Kayima *et al.*, 1996; Kumamoto *et al.*, 2002). Most deaths by AIDS are usually associated with opportunistic infection. However, several studies have suggested a correlation between low CD4+ counts and the presence of asymptomatic bacteriuria (Hoepelman *et al.*, 1992; De Pinho *et al.*, 1994; Awolude *et al.*, 2011).

A report from Calabar indicates that HIV positive individuals with $CD_4$+ count of less than $200x10^9$ $L^{-1}$ had the highest rate of asymptomatic bacteriuria (Inyang-Etoh *et al.*, 2009).

Result from a study on UTI among HIV infected individuals in Libya revealed that microscopic urinalysis (urine dipstick) alone cannot accurately predict occurrence of UTI (Buzayan and Taher, 2009).

In Nigeria, Samuel *et al.*, (2012), reported *Escherichia coli* as the most frequently isolated pathogen among HIV positive individuals. Gram positive organisms, including *Staphylococcus aureus*, have also been reported as pathogens in HIV positive individuals with asymptomatic UTI (Inyang-Etoh *et al.*, 2009).

Screening of urine for asymptomatic bacteriuria does not form part of the routine test for the management of HIV patient against opportunistic infections in HIV care centres. Many workers had reported occurrence of UTI as one of the opportunistic infections in HIV positive patients.

We therefore conduct this study to determine the prevalence, etiology, antibiotic sensitivity and indicators of asymptomatic UTI among HIV positive individuals in our health care centres in Jos, Nigeria.

## Materials and Methods

### Study design

This study was a prospective cross sectional study carried out between April to July of 2013 in Jos, North central Nigeria.

### Study population/Area

The study was carried out on 389 asymptomatic HIV positive individual assessing health care at APIN (AIDS Prevention Initiative in Nigeria) Jengre and Faithalive Foundation in Jos, North central Nigeria.

### Ethical considerations

Ethical clearance was obtained from the research and ethics committee of APIN Jengre and Faithalive Foundation in Jos.

Specimens were collected from individuals who consented to participate in the study.

### Data collection

A standardized questionnaire was used to collect demographic data from participants. The following information was captured on the questionnaire: age, sex, occupation, pre/post antibiotic use, CD4 status, educational level, marital status etc.

### Sample collection

The present study was carried out by collecting 5ml of mid-stream urine (MSU) specimen from female and male HIV positive individuals without symptoms of UTI.

The samples were labeled and transported to the laboratory within 1hour of collection.

An aliquot of urine specimen (0.001 ml) was streak-inoculated unto a chocolate agar and cysteine lactose electrolyte deficient (CLED) agar plates. These agar plates were incubated at 35˚C for 24 hours under aerobic conditions. Isolates were considered significant if there were $\geq 10^5$ colony forming unit/ml (CFU/ml) with not more than one colony (Washington, 2006). Significant isolates were identified by colonial appearance, Gram stain reaction and morphology and biochemical techniques (Barrow *et al.,* 2003).

Urine microscopy was carried out by centrifugation at 2500 revolution per minute (rpm) for 5minutes. The supernatant was poured off gently, and drop of sediment was placed on a clean slide, covered with coverslip and examined using x10 and x40 objectives. Pus cells and red cells were examined and reported accordingly.

Dipstick urinalysis was carried out to detect the presence of protein, nitrites, leukocytes esterase and red blood cells using COMBI 9 test strips **(**Macherey-Nagel, Germany).

Antibiotic susceptibility test was performed on isolates using disc diffusion method as recommended by Kirby and Bauer (1966). Broth suspension of the organism was made by transferring colonies from plate to peptone water and incubated overnight at $37^oC$.

The inoculum was adjusted to 0.5 McFarland (McFarland, 1907).

The McFarland standardized bacterial suspension was inoculated over the surface of the nutrient agar plate using a sterile swab, the surface was allowed to dry. Then appropriate antibiotic discs (Abek Biological Ltd, Liverpool UK) were placed and plates were overnight at incubated at $37^0C$. Based on the diameter of zone of inhibition, isolates were classified as susceptible and resistance.

**Data analysis**

Data collected were analyzed by EPI info statistical package version 3.5.1. chi-square ($X^2$) was used to compare association between variables and p- values of 0.05 was considered significant at 95.0% confidence level.

**Results and Discussion**

Table 1 revealed the demographic characteristic of the study participants which participants include 389 HIV positive individual of all ages, 75 individuals were reported to have had asymptomatic UTI (AUTI) giving an overall prevalence of 19.3%. Occurrence of infection was more in female subject 57(21.7%). According to marital status, married individual had more prevalence of AUTI 37(13.6%) compared to the unmarried. Individuals with no formal education and those in the business category had highest occurrence of AUTI with 6(75.0%) and 17(16.2%) respectively.

Table 2 indicates the percentage occurrence of isolates in the study. *Escherichia coli* was the most frequently occurring isolates 36(48.0%), whereas *Candida albicans* is the only non bacterial isolates reported in this study.

Table 3a/b depicts the predictors of UTI using microscopic examination of urine and urine dipstick respectively. Individuals with greater than 15 pus cells in their urine sediments were more likely to have UTI. Out of 33 participants who had protein in their urine (by urine dipstick) 16 (4.1%) had positive urine culture. The relationship between other abnormal urine findings and

positive cultures were in the following order nitrite (2/2 0.5%), leucocyte esterase (4/8 1.0%), hematuria (4/8 1.0%).

The distribution of asymptomatic bacteriuria by level of $CD^{+}_{4}$ counts reveals that individuals with range of 201–400 counts had highest frequency of UTI (26/99 26.3%) whereas the least occurrence was observed within the range of 1–200 counts (7/57 12.3%) (Table 4).

**Table.1** Demographic characteristics of study participants and occurrence of UTI

| Variables | No. Screened | No Positive (%) | p-value |
|---|---|---|---|
| **Age (year)** | | | |
| <1 | 2 | 1(50.0) | 0.128 |
| 2-11 | 19 | 0(0.0) | |
| 12-21 | 16 | 5(31.3) | |
| 22-31 | 98 | 23(23.5) | |
| 32-41 | 138 | 25(18.1) | |
| >42 | 116 | 21(18.1) | |
| **Sex** | | | |
| Male | 126 | 18(14.3) | 0.084 |
| Female | 263 | 57(21.7) | |
| **Marital status** | | | |
| Married | 272 | 37(13.6) | 0.344 |
| Single | 112 | 12(10.7) | |
| Widow | 2 | 1(50.0) | |
| Divorced | 3 | 0(0.0) | |
| **Educational level** | | | |
| Tertiary | 125 | 11(8.8) | 0.008 |
| Secondary | 169 | 24(14.2) | |
| Primary | 87 | 9(10.3) | |
| None | 8 | 6(75.0) | |
| **Occupation** | | | |
| Business | 105 | 17(16.2) | 0.303 |
| Civil servant | 48 | 6(12.5) | |
| Student | 88 | 8(9.0) | |
| Farmer | 31 | 5(16.1) | |
| Driver | 22 | 3(13.6) | |
| Artisan | 41 | 5(12.2) | |
| Others | 54 | 3(5.5) | |

Total number of study participants (N) = 389

**Table.2** Isolated organisms

| Organism | Frequency(%) |
|---|---|
| *Escherichia coli* | 36(48.0) |
| *Staphylococcus aureus* | 17(22.6) |
| *Proteus mirabilis* | 8(10.6) |
| *Pseudomonas aeruginosa* | 4(5.3) |
| *Klebsiella spp.* | 2(2.6) |
| *Candida albicans* | 8(10.6) |
| Total | 75(100.0) |

**Table.3a** Abnormal urine findings (Predictors of UTI, microscopy) and occurrence of UTI

| Variable | No. Screened | No. Positive(%) | p-value |
|---|---|---|---|
| **Pus cell(phf)** | | | |
| Nil | 257 | 17(6.6) | 0.000 |
| 0-2 | 50 | 7(14.0) | |
| 3-5 | 26 | 12(46.2) | |
| 6-8 | 13 | 8(61.5) | |
| 9-15 | 13 | 9(69.2) | |
| >15 | 30 | 22(73.3) | |
| Pyuria | 132 | 58(43.9) | |

phf: per high field

**Table.3b** Abnormal urine findings (Predictors of UTI using dipstick) and occurrence of UTI

| Variable | No. Positive | No. Negative | No. Positive culture(%) | p-value |
|---|---|---|---|---|
| **Protein** | 33 | 356 | 16(4.1) | 0.000 |
| **Nitrite** | 2 | 387 | 2(0.5) | 0.037 |
| **Leucocyte esterase** | 8 | 381 | 4(1.0) | 0.048 |
| **Blood/ hematuria** | 8 | 381 | 4(1.0) | 0.048 |
| Total | 51 | 338 | 26(6.7) | |

**Table.4** Distribution of asymptomatic bacteriuria (UTI) by level of CD4 counts

| CD4 counts($x10^9$/L) | No. Screened | No. Positive culture(%) | p-value |
|---|---|---|---|
| 1-200 | 57 | 7(12.3) | 0.248 |
| 201-400 | 99 | 26(26.3) | |
| 401-600 | 84 | 18(21.4) | |
| 601-800 | 64 | 9(14.1) | |
| 801-1000 | 39 | 6(15.4) | |
| >1000 | 46 | 9(19.6) | |
| Total | 389 | 75(19.3) | |

**Table.5** Antibiotic sensitivity pattern bacterial isolates

| Organism | No. of organisms isolated | SXT | CPX | AMP | AU | CN | PEF | OFX | S | CEP | NIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Escherichia coli* | 36 | 22(61.1) | 34(94.4) | 3(8.3) | 20(55.6) | 33(91.7) | 27(75.0) | 35(97.2) | 32(88.9) | 25(69.4) | 18(50.0 |
| *Staphylococcus aureus* | 17 | 10(58.8) | 15(88.8) | 3(17.7) | 5(29.4) | 13(76.5) | 9(53.0) | 4(23.5) | 15(88.2) | 0(0.0) | 1(5.9) |
| *Proteus mirabilis* | 8 | 6(75.0) | 7(87.5) | 1(12.5) | 6(75.0) | 7(87.5) | 7(87.5) | 8(100.0) | 7(87.5) | 7(87.5 | 4(50.0) |
| *Pseudomonas aeruginosa* | 4 | 0(0.0) | 3(75.0) | 0(0.0) | 0(0.0) | 2(50.0) | 1(25.0) | 2(50.0) | 2(50.0) | 1(25.0) | 1(25.0) |
| *Klebsiella spp.* | 2 | 1(50.0) | 2(100.0) | 1(50.0) | 0(0.0) | 2(100.0) | 1(50.0) | 2(100.0) | 2(100.0) | 1(50.0) | 1(50.0) |
| Total | 67 | 39(58.2) | 61(91.0) | 8(11.9) | 31(46.3) | 57(85.1) | 45(67.2) | 51(76.1) | 58(86.6) | 34(50.8) | 25(37.3) |

**KEY**

| | | | | | |
|---|---|---|---|---|---|
| Septrin 30µg | SXT | Gentamcin 10 µg | CN | Ceporex 10 µg | CEP |
| Ciprofloxacin10 µg | CPX | Pefloxacin 10 µg | PEF | Nitrofurantoin 200 µg | NIT |
| Ampicillin 30 µg | AMP | Ofloxacin 10 µg | OFX | | |
| Augmentin 30 µg | AU | Streptomycin 10 µg | S | | |

Table 5 shows the antibiotic susceptibility pattern of the isolated uropathogens. We observed that isolates exhibit highest resistance to ampicillin (8/67 11.9%) and least resistance to ciprofloxacin (61/67 91.0%). *Pseudomonas aeruginosa* exhibit multidrug resistance to most of the antibiotic used.

However, our prevalence was lower than the findings of Jombo *et al.* (2005) who reported 24% in Jos and Inyang-etoh *et al.* (2009) who reported (25.3%) from Calabar. Subjects within the age group of less than 1year had the highest prevalence 1(50.0%), this could be due to sampling error as the number of subjects in this category were few. Several reports have indicated that females are more prone to having UTIs than males (Samuel *et al.*, 2012; Omoregie *et al.*, 2009). The reason for high prevalence among female may be connected with the anatomical structure of female genitalia (short and wider urethra) and the proximity of female genitalia to the anal region. The high prevalence among the widow 50.0% was due to sampling error as only two individuals were screened. The married had a higher occurrence compared to the singles 13.6% and 10.7% in that order. This is in tandem with the report Nicolle (2008) from Canada who associated high prevalence among the married with the term honey moon cystitis which is defined as the phenomenon of frequent UTIs during early marriage. Based on occupation UTI was more common among the Business class than others. A low incidence rate of 8.8% was observed among individual who attended tertiary education, this shows that education improve awareness to risk of infection of the urinary tract. Bacterial isolates in this study were predominantly gram negative organism with *Escherichia coli* showing the highest prevalence, this is similar to other reports in Nigeria (Bigwan and Wakjissa, 2013; Samuel *et al.*, 2012; Jombo *et al.*, 2005). Conversely, Inyang-etoh *et al.*, (2009) reported *Staphylococcus aureus* as the preponderant bacteria in asymptomatic UTI in HIV positive individuals. The frequency of pyuria (microscopy) and positive culture was (58/132 43.9%), this suggest that individuals with pyuria are more likely to have UTI. Also, nitrite, leucocyte esterase and hematuria were also noted to be predictors of UTI this is in tandem with a report from Tanzania (Francis *et al.*, 2013).

The highest occurrence of UTI was also observed among participants with CD4+ count range 201-400x$10^9$ /L (26.3%). There was no statistically significant association between occurrence of infection and level of CD4+ count ($p>0.05$; $p=0.248$). This agrees with a report from Benin, Nigeria (Omoregie and Eghafona, 2009). But this contradicts the work of Inyang etoh *et al.* (2009) and Hoepelman *et al.* (1992) who noted highest occurrence at CD4+ count 1 - 200 x$10^9$ /L (92.3%) and (30%) respectively.

High resistance of isolated bacteria to ampicillin and sensitivity to ciprofloxacin was noted, this is in consonance with the report of Samuel *et al.* (2012) from Benin, Nigeria, Msaki *et al.* (2012) and Festo *et al.* (2011) in north-western Tanzania. These antibiotics are widely available at the primary health care level and are easily accessed from local chemists without prescriptions, resulting in irrational use of antibiotics.

Asymptomatic urinary tract infection is prevalent among HIV positive individuals accessing health facilities in Jos, and UTI could be predicted by nitrite, leucocyte esterase and hematuria positive dipstick test. The commonest isolates were *E coli* and

*Staphylococcus aureus* which had a high resistance to ampicillin. There is need to stress the importance of screening HIV positive individual for asymptomatic UTI.

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