Prevalence of Urinary Tract Infection (UTIs) Among HIV Sero-Positive Patients Attending Selected Hospitals at Otukpo Benue State, Nigeria

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Abstract:
Prevalence of uropathogenic bacteria among HIV sero-positive Patients attending selected Hospitals at Otukpo Benue State Nigeria was investigated. A total of 392 mid-stream urine samples from Patients with HIV infection attending St. Daniel Hospital, Royal Specialist Hospital, General Hospital and St. Charles Hospital was collected and analyzed using standard Microbiological and biochemical methods for isolation and identification of organisms. Prevalence of the infection was also determined. Socio-demographic variables were obtained using a pre-designed structured questionnaire. Data were entered into a data base designed using SPSS Statistical software version 20 and analyzed using Chi square. Out of 392 samples, 115 were tested positive for urinary tract infections and five different types of bacteria were isolated. The bacteria isolated and their prevalence were Escherichia coli 42(36.5%), Proteus mirabilis 32(27.8%), Pseudomonas aeruginosa 17(14.8%), Staphylococcus aureus 12(10.4%) and Klebsiella pneumoniae 12(10.4%). The overall prevalence of urinary tract infection in HIV patients was 29.3%. The female had prevalence of 30.9%, while the male had 27.4%. The age group 16-25years had the highest occurrence 16(33.3%). Based on occupation, business people had the highest positivity rate of 38(31.1%). The married had 43(30.7%) positivity rate. The prevalence of urinary tract infections among the HIV negative individuals was 26.9%. The information provided in this report is useful in the clinical management of urinary tract infections among HIV sero-positive patients in the study area

Keywords: UTIs, HIV, Prevalence, Bacteria, Clinical management

INTRODUCTION

Urinary Tract Infection is an infection in any part of the urinary system-kidneys, ureters, bladder and urethra. Urinary Tract Infections (UTIs) are the inflammatory disorders of the urinary tract caused by the abnormal growth of pathogens. Urinary tract infection is known to cause short-term morbidity in terms of fever, dysuria, and lower abdominal pain (LAP) and may result in permanent scarring of the kidney. Most Urinary tract infection (UTI) involves the lower urinary tract -the bladder and the urethra (Samuel *et al.*, 2012). Urinary tract infection (UTI) 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 (Samuel *et al.*, 2012). 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 (Bigwan and Wakjissa, 2013).

The prevalence of urinary tract infection among Human Immunodeficiency Virus patients has been documented in previous studies across the world including Nigeria, but there is paucity of

data as regards UTI in HIV patients in Otukpo metropolis. Human Immunodeficiency virus/Acquired Immune Deficiency syndrome (HIV/AIDS) now ranks as one of the leading causes of morbidity and mortality in both children and adults (Abraham and Miao, 2015), and increasingly more persons are either infected or dying from it (Colgan and William, 2011). Human Immunodeficiency virus (HIV) is remarkable for its preference for T-lymphocytes and macrophages, which are rendered incompetent or depleted while opportunities are provided for organisms and agents of low virulence to establish themselves and cause various infections and further morbidities (Abraham and Miao, 2015). Acquired immunodeficiency syndrome (AIDS), caused by human immunodeficiency virus (HIV), is characterized by progressive damage to the immune system, resulting in the development of various opportunistic infections. Among the opportunistic infections in HIV patients, research has focused on tuberculosis, sexually transmitted infections and malaria. Patients with Acquired Immune Deficiency Syndrome have UTI more frequently compared to HIV positive patients without AIDS (Nester, *et al.,* 2009). The present study was undertaken to unravel the status of urinary tract infection in the geographical area of the study. It sought to address the menace of urinary tract infection in HIV/AIDS patients especially in the area of study which underscores the relevance of this research. More so, this research would produce the latest burden, data of urinary tract infections and provides a comprehensive picture of the specific characteristics of this disease in different hospital settings, socio-demographic status, age groups and sexes. The overall aim of this study was to determine the prevalence of bacterial uropathogens in HIV-infected individuals attending selected health facilities in Otukpo metropolis of Benue State, Nigeria.

MATERIALS AND METHODS

Study Area

This study was carried out in General Hospital and other Hospitals (St. Daniel, Royal specialist, St Charles) located in Otukpo metropolis (Figure 1) between February and May 2020. The Local Government has a landmass of 390 sq.km with a population of 190,457(1991 census). Otukpo is centrally located between the Tiv, in Benue State and the Igala Area of Kogi State. Otukpo Local Government Area with its headquarters in Otukpo town is centrally located in Idoma Land. Otukpo is the oldest and most developed Local Government area in Idoma land.
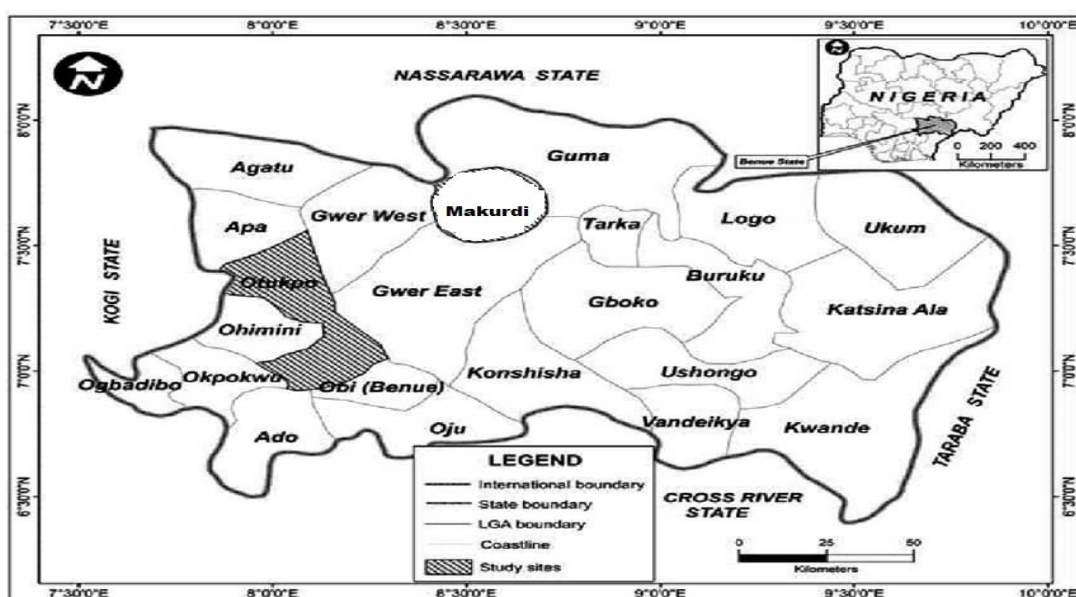

Figure 1: The Map of Benue State Showing the Study Area (Otukpo)
Source: https//www.researchgate.net

Ethical Considerations
An ethical approval was sought and obtained from Ethical Clearance Committee of Benue State Ministry of Health, Makurdi. Participants were given a full right to continue or withdraw from the study. Information obtained at each course of the study was kept confidential.

Sample Size and Sampling Techniques
The sample size was determined using the equation for sample size according to Patra (2012). All adult (18 years old and above) that were tested HIV positive (that are registered and receiving care at the hospitals) without current antibiotics therapy and willing to participate were included in the research.

Specimen Collection
Early morning 7-10ml mid-stream urine specimens were collected from 392 study participants in sterile screw capped labelled (abbreviation of hospital name and unique identification number) universal bottles. These were transported immediately on ice packs in a cooler to the Department of Medical Laboratory Science, General Hospital Otukpo for processing. All the specimens were analysed within an hour of collection. Socio-demographic variables (age, sex, education level, occupation, marital status) were obtained using a pre-designed structured consent form.

Culturing of Urine Specimens
Using calibrated wire loop (0.001 ml), a well labelled urine samples were inoculated into Cystine Lactose Electrolyte Deficient (CLED) agar, Mac-Conkey agar and Blood agar plates (BAP) medium (Oxoid, LTD) by method of streaking on a dry medium in the Petri dishes. After overnight incubation at 37°C for 24 hours, colonies were observed to check for significant bacteriuria (Cheesbrough, 2009). All the procedures were conducted in the Microbiology unit of Medical Laboratory Department of General Hospital Otukpo.

Identification of Isolates
Identification of bacteria was done using colony characteristics, Gram reaction of the organisms and biochemical tests (catalase test, coagulase test, urease, citrate test, indole test, sugar fermentation and oxidase test) and the flow chart was followed to identified the bacteria species that were isolated (Cheesbrough, 2009).

Colonial Characterization and Motility Test
The inoculated media were morphologically examined for size, colour, and fermentation of lactose. Cystine Lactose Electrolyte Deficient (CLED) agar medium contain bromothymol blue though the colonies appeared yellow in acid pH, and green in alkaline pH. About 2-3 drops of peptone water with growth of the bacteria was placed on a clean glass slide with the aid of a sterile wire loop. A cover slip was placed over the slide. The slide was left for some second and then examined microscopically with ×40 objective; motile organism was seen swimming around (Ochayi and Kolhatkkar, 2008).

Biochemical Tests for Identification of Bacteria Isolates
Gram staining technique followed a standard method employed by Cheesbrough (2009) where bacteria were differentiated as Gram positive (purple colour retained) or and Gram negative (red or pink colour retained. Other biochemical tests carried out to identify the isolates were: Catalase, Coagulase, Citrate, Indole, Methyl red, Urease and Oxidase tests (Collee *et al*, 1996; Ochayi and Kolhatkkar, 2008; Cheesbrough, 2009).

Data Analysis
Data analysis was done on the SPSS application package for descriptive and inferential statistics.

RESULTS

The results of the microbiological analysis showed that 115 samples came out positive for UTI. Five (5) different bacteria species were identified: *Escherichia coli, Staphylococcus aureus, Proteus mirabilis, Klebsiella pneumoniae* and *Pseudomonas aeruginosa* with their numbers isolated and the respective percentages were 42(36.5%), 12(10.4%), 32(27.8%), 12(10.4%) and 17(14.8%)) respectively (Figure 2). The Ninety-Eight urine samples collected from the HIV negative patients as a control showed that twenty-six (26) of the samples were positive for urinary tract infection. Figure 3 revealed bar chart showing the five different bacteria species that were isolated. The number of each species of bacteria isolated and their percentage occurrence were *Escherichia coli* 11(42%), *Staphylococcus aureus* 4(15%), *Proteus mirabilis* 6(23%), *Klebsiella pneumonia* 2(7%) and *Pseudomonas aeruginosa* 3(12%).
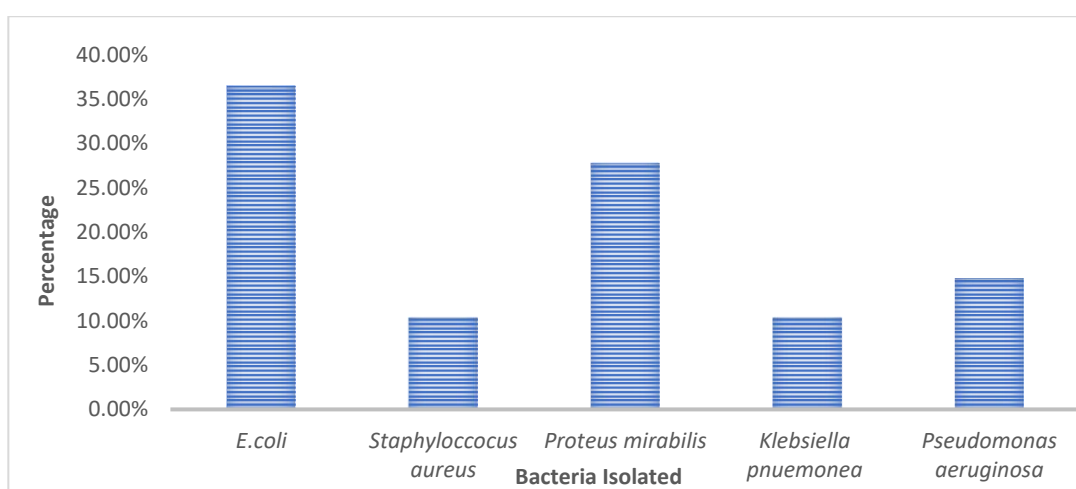

Figure 2: Bar Chart Showing the Distribution of Bacteria Isolated from the Sample of HIV Positive Individual Attending Selected Hospitals in Otukpo Metropolis.
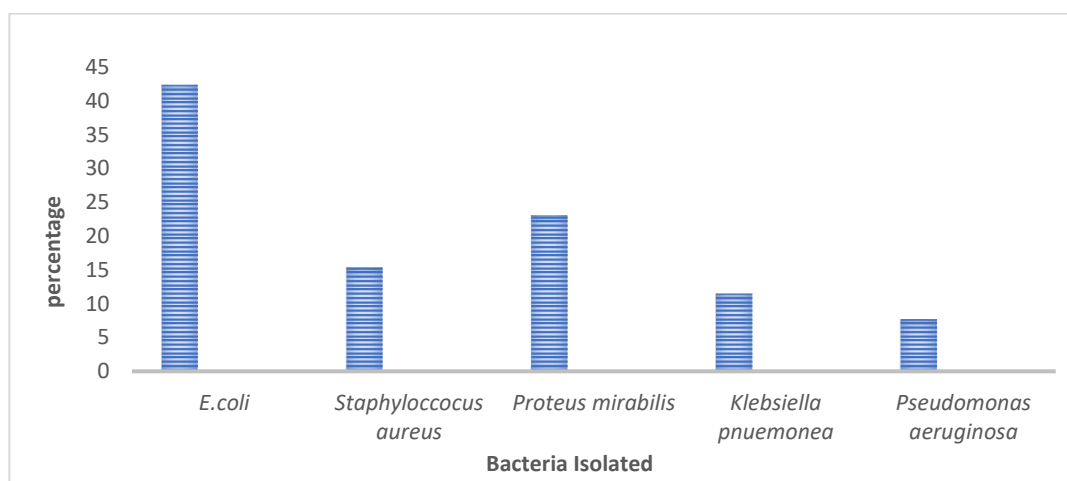

Figure 3: Bar Chart Showing the Distribution of Bacteria Isolated from Urine Specimen of HIV Negative Individual Attending Hospital in Otukpo Metropolis

Table 1 shows a total of Three hundred and ninety-two (392) urine samples that were collected and microbiologically examined for urinary tract infections among HIV positive participants

attending the four selected hospital in Otukpo metropolis (St. Charles, General hospital, St. Daniel and Royal Specialist Hospital, Otukpo). Among the 395 urine samples collected, 175 were males and 217 were females. From the male participants a total of 48(27.4%) were tested positive for UTI, and 67(30.9%) female participants came out positive. The total positive samples from both male and female was 115 thereby given us the overall prevalence of 29.3% of UTI in this research. Based on age distribution, the age bracket 16-25 years had the total of 48 participants out of which 16 samples came out positive representing 33.3% positive cases while the rest 32 samples came out negative for UTI with 66.7% negativity rate. The age range of 26-35 years had a total of 96 individuals that participated in the research but 29 came out positive representing 30.2% positivity rate while 67 came out negative with 69.8% negativity rate. The next age bracket was 36-45 years which had a total of 120 participants with 36 samples came out positive representing 30.0% positive rate and 84 negative samples with 70.0% negativity rate. The age group 46-55 years had 95 participants out of which 24(25.3%) came out positive for UTI while 71(74.7%) were negative with the P-value of 0.004. Age group 56-65 years had a total of 33 participants but 10(30.3%) came out positive while 23(69.7%) were reported negative for urinary tract infections and P-value of 0.106.

Based on the occupation of the participants, civil servants had a total of 98 participants and 26(26.5%) came out positive while 72(73.5%) samples came out negative; farmers recorded a total of 123 participants but among these, 37(30.1%) came out positive while 86(69.9) came out to be negative for UTI. In business, the total of 122 individuals took part in the research of which 38(31.1%) came out positive leaving 84(68.9%) negative for UTI and a P-value of 0.005. On the part of schooling, there was a total of 49 participants resulting in 14(28.6%) as positive and 35(71.4%) negatives for UTI. On the marital status, the married had a total of 140 individuals that participated in the research and 43(30.7%) came out positive leaving 97(69.3%) as negative for urinary tract infection and had P-value of 0.008. The singles had 30(36.1%) positivity rate and 52(63.9%) as negative from the total of 83 participants that were examined. The widows had 106 participants but came out with 27(25.5%) positive samples and 79(74.5%) negative, while widower had 15(23.8%) positivity rate and 48(76.2%) as negative for UTI from 63 samples examined.

Table 1: Overall Distribution of Urinary Tract Infections Among Positive Individuals Attending the Four Selected Hospitals (General Hospital, St. Daniel, Royal Specialist and St. Charles)

Demographic Variables	No. Tested	No. Positive (%)	No. Negative (%)	P-Value
Sex				
Male	175	48 (27.4)	127 (72.6)	0.001
Female	217	67 (30.9)	150 (69.1)	0.003
Total	392	115(29.3)	277(70.7)	
Age				
16 – 25	48	16 (33.3)	32 (66.7)	0.081
26 – 35	96	29 (30.2)	67 (69.8)	0.069
36 – 45	120	36 (30.0)	84 (70.0)	0.340
46 – 55	95	24 (25.3)	71 (74.7)	0.004
56 – 65	33	10 (30.3)	23 (69.7)	0.106
Total	392	115(29.3)	277(70.7)	
Occupation				
Civil Servant	98	26 (26.5)	72 (73.5)	0.217
Farmers	123	37 (30.1)	86 (69.9)	0.026

Business	122	38 (31.1)	84 (68.9)	0.005
Schooling	49	14 (28.6)	35 (71.4)	0.431
Total	392	115(29.3)	277(70.7)	
Marital Status				
Married	140	43 (30.7)	97 (69.3)	0.008
Singles	83	30 (36.1) `	52 (63.9)	0.289
Widows	106	27 (25.5)	79 (74.5)	0.012
Widower	63	15 (23.8)	48 (76.2)	0.062
Total	392	115(29.3)	277(70.7)	

DISCUSSION

The result of urine culture from Human Immunodeficiency Virus (HIV) positive patient assessing care at selected Hospitals Otukpo revealed that, five (5) different types of bacteria were isolated and identified, among them were; *Escherichia coli, Proteus mirabilis, Staphylococcus aureus, Pseudomonas aeruginosa* and *Klebsiella pneumoniae*. Among the bacteria isolated, the most common isolates were *Escherichia coli*, followed by *Proteus mirabilis.* Equivalent finding on *E. coli* have been reported in Ibadan, Nigeria, (Okonko *et al.*, 2010). *Escherichia coli* are the most common microorganism (Bacteria) in the vaginal and rectal area (Hannan *et al.*, 2010). This high rate may be due to the inherent virulence of *E. coli* for urinary tract colonization such as its association to adhere to the urinary tracts and also association with other microorganism moving from the perineum areas contaminated with faecal microbes to the moist warmth environment of the genitalia (Kabugo *et al.*, 2016).

Likewise, *Escherichia coli* ranked highest among the bacteria isolated from the urine samples of the HIV Sero-negative individuals attending the hospital. *Klebsiella pneumoniae* was the least among the bacteria isolated. The result of urine culture from Human Immunodeficiency Virus (HIV) positive participants assessing care at General Hospital Otukpo showed that, urinary tract infections was higher in female participants than their male counterparts. This result agrees with the study carried out by Eltigani and Amira (2009), who asserted that "female was more infected with urinary tract infections than the male subjects". The higher prevalence in female participants may be due to the anatomical structure of the female genital tract which makes them more susceptible to urinary tract infections compared to male irrespective of their sero-HIV status as asserted by Flores-Mireles *et al.* (2015). Based on age, the age group 36 – 45 years had the highest number of subjects screened for urinary tract infections, but the age group 16 – 25years had the highest positive percentage rate. The high percentage positivity rate in this age group may be due to the high sexual activities engaged by this age bracket as reported by Heffner and Gorelick (2008). As regards occupation, business people had the highest number of subjects screened for UTI; however civil servants recorded the highest positivity rate.

In St. Daniel Hospital, the prevalence of urinary tract infection (UTI) is lower compared to General Hospital. In this hospital, the female subjects had higher positive rate of urinary tract infection than the male counterparts. Evidence from previous studies showed that UTIs were more common in female than their male counterparts (Amdekar *et al.,* 2011). Occupationally, farmers had highest number of positive cases of UTI than other occupations. On Marital status, married subjects had the highest positive cases of urinary tract infection. This may be attributed to the increased sexual activities among the married couples as reported by Heffner and Gorelick (2008). The result from Royal Specialist hospital showed a higher rate of UTI than the report of St. Daniel hospital. In this hospital, the male participants had lower rate of the infection than the female

counterparts. Finding in this study agrees with other reports from Irrua, Edo State, Nigeria in which females accounted for 32.2% (Samuel *et al.*, 2012). The age distribution showed that the age 26-35years had the highest number of subjects that were tested for urinary tract infections; however, the age 36-45years recorded the highest prevalence of urinary tract infection. Although, UTIs is not age dependent but its incidence can be increased by sexual activities as reported by Ieriebor *et al*. (2012). The age range of 56-65 years had the least number of subjects screened for UTI in this hospital. Occupationally; business people had the highest prevalence rate followed by schooling. This may be due to holding of urine for a long time without emptying the bladder on time (Tanagho and Mcaninch, 2004).

The distribution of urinary tract infections in St. Charles Hospital revealed that the female subjects had higher prevalence rate than the male subjects. The differences, agrees with other work as reported by Samuel *et al.* (2012). Based on age distribution, the age group 26-35years had the highest prevalence of UTI and age group 16-25years had the lowest positivity rate. The increase prevalence in age 26-35years compared to other age group could be attributed to more sexual activities exhibited by this group as reported by Heffner and Gorelick (2008). Regarding the occupation, the farmers had the highest prevalence rate of urinary tract infections while civil servants had the least prevalence of the infection. The high rate of positivity in farmers may be attributed to less concerned about personal hygiene compared to other occupation (Goldstein *et al.*, 2013).

In this study, the overall prevalence of urinary tract infections among HIV positive individual was 29.3% and was higher in female compared to male but both had significant P-value ($P<0.05$) as shown in the result. This may be due to higher numbers of female receiving cares in these centers compared to males. However, evidences from various epidemiological studies showed that urinary tract infections were more common in female than their male counterparts (Glaser and Schaeffer, 2015). The findings of urinary tract infections prevalence in this study were higher than other reports in Nigeria including Irrua, Edo State 30.3% (Samuel *et al.*, 2012), Benin City, Nigeria, 27.8% (Omoregie and Eghafona, 2009) and Calabar, Nigeria, 24.0% (Jombo *et al.*, 2010).

However, Hayami *et al.* (2013) showed 88% higher infection rate of urinary tract infections in female and asserted that the increase rate may not be unconnected to the general increased risk of women to acquire this infection. This is probably due to the anatomical structure of the female genital tract and pregnancy which makes them more susceptible to UTIs compared to male irrespective of their HIV sero-status (Rajar, 2009). This inconsistency and differences in results of various authors may be due to variances in the environmental background and social habits of the communities in addition to the economic situation, awareness and knowledge of the clients' hygiene standards (Salwa and Almukhtar, 2018).

The combined data from all the selected hospitals showed that the age bracket 16-25years had the highest prevalence rate of urinary tract infection, though the age group 36-45years had the highest number of positive cases of urinary tract infections. The increased urinary tract infection in 16-25 years of the age group may be due to sexual activeness (so called honey moon cystitis and pregnancy) as reported by Schwartz (2013). In this research, the occupation with the highest prevalence was business. This finding contradicts the finding of Okonkwo *et al.* (2010), in Nigeria, who found that the highest percentage of urinary tract infections was among the civil workers followed by Teachers and business people. However, in this study schooling (students) had the lowest percentage of urinary tract infections which agrees with the report of Okonkwo *et al.*

(2010) that had 30.4% among the students. This might be attributed to the observance of high standard personal hygiene exhibited by the students. Based on marital status, the married had the highest number of participants followed by the singles. This may be attributed to the vulnerability of women to urinary tract infections among the married and the singles due to the use of spermicides that may alter vaginal pH and thus affect its flora, particularly the Lactobacilli component (Sibiani, 2010).

Comparatively, the prevalence of urinary tract infection among the HIV negative participants was lower than the prevalence among the HIV positive individuals. This may be due to the weakened immune system of the HIV positive clients. This agreed with the report from Jombo *et al.* (2010): Patients with Human Immunodeficiency Virus were more susceptible to urinary tract infections than those with HIV Sero-negative clients. The prevalence in male and female of HIV negative individuals with urinary tract infections are lower compared to prevalence in male and female HIV positive individuals. Both males and females' participants of those with HIV Sero-positive have higher urinary tract infections prevalence than the HIV Sero-negative individuals. The reason may be attributed to the low immune system of the HIV positive individuals. Based on marital status, the married had the highest urinary tract infections positive rate while the widower had the lowest. The reason probably maybe due to lack of postcoital urination, vaginal douches, use of hot tubs and restrictive underwear may lead to increase in UTI prevalence among this group of people as reported by Dielubanza and Schaeffer (2013).

CONCLUSION

In this study, the overall prevalence of Urinary Tract Infections in HIV patients was 29.3%. Female were more infected with urinary tract infections than their male counterpart. Prevalence was highest among business people 38(31.1%) and the married 43(30.7%). *Escherichia coli* was the most predominant bacteria isolated followed by *Proteus mirabilis*. The information provided in this report is useful in the clinical management of urinary tract infections among HIV sero-positive patients in the study area

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