

# Urinary Tract Infections Among Female Students Of The University Of Agriculture, Makurdi, Benue State, Nigeria

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## Abstract

Samples of urine and High Vagina Swabs (HVS) were collected from 213 volunteer female students in the female hostel of University of Agriculture, Makurdi, and examined for pathogenic organisms. Of these samples, 204 (95.77%) had at least one infection. The organisms isolated include *Staphylococcus aureus* which had the highest prevalence of 120(56.34%) in urine and 108(50.70%) in HVS samples; *Escherichia coli* was next with 60 (28.17%) in urine, others were *Streptococcus pyogenes* in 18(8.45%) urine and 39 (18.31%) HVS samples. *Trichomonas vaginalis* was identified only in 12 (5.63%) HVS samples. The age group 20 – 24 years had the highest prevalence. Mixed infections were also observed. The implications of these findings were discussed.

## INTRODUCTION

The urinary tract consists of various organs of the body involved in the production, storage and excretion of urine. These organs are always at risk of infection by micro-organisms, especially bacteria (1). Urinary tract infections(UTIs) are a variety of clinical entities whose common denominator is microbial invasion of tissues of the urinary tract, extending from the renal cortex of the kidneys to the urethral meatus(2). The invading microbe may affect the entire tract or may be restricted or localized to the upper region or the kidneys(pyelonephritis) or lower region where the organs invaded may be the bladder(cystitis); prostate(prostatitis) and urethra(urethritis) or restricted to the urine only. The infections may be asymptomatic, acute, chronic or recurrent and complicated or uncomplicated(3).

Women are generally more prone to having UTI than men due to their having a short urethra and vaginal vestibule which can easily be contaminated (3). In neonates UTI is more common in males than females due to greater frequency of congenital anomalies of urinary tract of the male infants(4). Among the pre-school children, it is 10 – 20 times more common in girls than boys, and 5 – 6% of secondary school girls would have been infected between the time of entry and graduation(2). Among teenagers, UTI is due mainly to urethra trauma from sexual activities (5), while peak prevalence is about 20% (3). For pregnant women, 2-4% usually develop UTI which is likely to travel

to the kidneys resulting in pyelonephritis due to hormonal changes and shift in the position of the urinary tract that makes it easy for travel upwards (7).

Urinary tract infections are usually untreated because they present little or no symptoms. These symptoms generally depend on the age of the person infected and the location of the urinary tract infected. It includes, among others, burning sensations while urinating, fever, lower abdominal pain, jaundice due to loss of blood, especially in children, dysuria, itching, formation of blisters and ulcers in the genital area, genital and suprapubic pain, dyspareunia (painful coitus) and pyuria (8,9,10,11).

In the present study, urine and higher vaginal swab (HVS) of 213 volunteer female undergraduate students, of the University of Agriculture, Makurdi were collected and examined to determine the status of urinary tract infections among them.

## MATERIALS AND METHODS

The study population was female students resident in the University of Agriculture, Makurdi, Nigeria, female hostel. The sample population was 213 undergraduates who volunteered to be sampled for the study. Sterile high vaginal swab sticks were used to collect HVS of each volunteer student using the procedure specified in Cheersbrought (12). Their urine samples were also collected. Containers of the sterile swab sticks were closed immediately after swabs were

collected to avoid contamination. Before samples were collected, each student was enlightened on the purpose and importance of the study to her and her immediate community in particular. A questionnaire was used to obtain information on the biodata and history of urinary tract infection of each student sampled. The questionnaire also contained a guide on how the HVS and urine samples were to be collected. Wet preparations of HVS and urine samples were microscopically examined, first with X10 and then, X40 objective (for confirmation). Wet preparations of the HVS were obtained by putting two drops of normal saline into the swab container and mixing with the exudates collected on the swab stick, while for urine, 5-10ml were put into centrifuge tubes and centrifuged at 1000rpm for 5 minutes and the supernatants decanted. The HVS wet preparations were cultured on chocolate and blood agar through the streak plate method using flamed wire loop, while wet preparations of the urine samples were cultured on CLED and macconkey agar, using the same method, Inoculated plates were incubated for 24 hours at 37° C after which all the plates were read and isolates characterized. Standard identification procedures of Gram stain reaction, catalase test, coagulase test, indole production, oxidase test, sugar fermentation and urease test were used to determine the micro-organisms present in the samples.

## RESULTS

From 426 samples (213 urine and 213 HVS) collected, 408 (95.77%) had positive microbial isolates while 18 (4.23%) had no isolates. Among the 408 samples that had positive isolates, *Staphylococcus aureus*, which was the highest cause of infection, was found in 120 (56.34%) urine and 108 (50.70%) HVS samples. *Trichomonas vaginalis* was found in only 12 (5.63%) HVS samples, and was the least cause of infection. Isolated organisms and the number infected by each are summarized in table 1. from the previous history of the volunteers who had positive isolates. 72 (35.29%) had been diagnosed to have UTIs previously (Table 2). Age distribution of volunteers and prevalence of infection amongst them are shown in table 3. Table 4 shows mixed infections, while table 5 shows the type of organisms that caused mixed infections in the volunteers and the number of females with each in urine and HVS samples.

**Figure 1**

Table 1: Prevalence of organisms diagnosed from urine and HVS samples

Infective organisms	Number of students examined	Number of positive urine samples (%)	Number of positive HVS samples (%)
<i>Staphylococcus aureus</i>	213	120 (56.34)	108 (50.70)
<i>Streptococcus pyogenes</i>	213	18 (8.45)	39 (18.31)
<i>Escherichia coli</i>	213	60 (28.17)	-
<i>Klebsiella sp.</i>	213	36 (16.90)	-
<i>Proteus sp.</i>	213	33 (15.49)	-
<i>Trichomonas vaginalis</i>	213	-	12 (5.63)
<i>Candida sp.</i>	213	18 (8.45)	39 (18.31)

**Figure 2**

Table 2: History of volunteers with positive isolates showing those previously Infected with UTI

No. of samples with positive isolates (%)	204 (95.77)
No. with previous UTI history and treated (%)	72 (33.80)
No with previous UTI and still infected (%)	66 (30.90)
No. with previous UTI and not infected (%)	6 (2.82)
No. with previous UTI and infected (%)	132 (62.00)

**Figure 3**

Table 3: prevalence of infection in relation to age

Age group (yr)	No. of students examined	No. positive (%)	No. negative (%)
15-19	18	15 (83.33)	3 (16.67)
20-29	174	168 (96.55)	6 (3.44)
25 and above	21	21 (100.00)	-
Total	213	204 (95.77)	9 (4.23)

**Figure 4**

Table 4: Mixed and single infections in urine and HVS samples

Samples	No. of samples examined	No. with mixed infections (%)	No. with single (%)	No. negative (%)
Urine	213	87 (40.85)	105 (49.30)	21 (9.86)
HVS	213	33 (15.49)	102 (47.89)	78 (36.6)
Total	426	120 (28.17)	207 (48.59)	99 (23.24)

**Figure 5**

Table 5: Prevalence of infective organisms in mixed infections

Organisms	No. in urine (%)	No. in HVS (%)
<i>S. aureus</i> and <i>S. pyogenes</i>	12 (5.63)	15 (7.04)
<i>S. aureus</i> and <i>E. coli</i>	27 (12.68)	6 (2.82)
<i>S. aureus</i> and <i>Proteus sp.</i>	24 (11.27)	-
<i>S. aureus</i> and <i>Klebsiella sp.</i>	9 (4.23)	-
<i>S. pyogenes</i> and <i>E. coli</i>	6 (2.82)	-
<i>S. aureus</i> and <i>Candida sp.</i>	9 (4.23)	12 (5.63)
Total	87 (40.85)	33 (15.49)

**Figure 6**

Table 6: Identification characteristics of bacteria isolates.

Coagula- se test	Oxida- se test	Catala- se test	Indole produc- tion	Urease test	Fermentation tests			organism
					Sucrose	Glucose	Lactose	
+	-	-	+	-	A	AG	AG	<i>E. coli</i>
+	-	-	-	-	A	AG	AG	<i>Klebsiell a sp.</i>
+	-	+	ND	-	A	A	A	<i>S. aureus</i>
+	-	-	+	+	-	A	-	<i>Proteus sp.</i>
-	+	-	ND	-	ND	ND	ND	<i>S. pyogenes</i>

Key:

- A = Acid
- G = Gas
- + = Positive
- = Negative
- ND = Not done

## DISCUSSION

Of the 213 female students that volunteered their urine and HVS samples for examination, 204 (95.77%) had positive isolates of microbial organisms, only 9 (4.23%) were negative (table 1). This agrees with the findings of David (13) who suggested that at least 1 in every 5 adult women experience UTI and about 50% of women will experience it at some point in their life.

The most prevalent bacterium in both samples was *Staphylococcus aureus* (table 1) this may be as a result of haematogenous or ascending infections (14). The next most prevalent was *E. coli* in urine. This agrees with an observation (4) that *E. coli* accounts for about 50% cases of UTIs. *S. pyogenes* was found to be 8 (8.45%) in urine and 39 (18.30%) in HVS samples. This implies that females are susceptible to these bacteria probably due to the proximity of the vagina to their anus, from where the bacteria can easily be massaged into their urethra during improper wiping from back to the front after urination or bowel movement, and during sexual intercourse, as reported earlier (15).

*Klebsiella sp.* was responsible for 16.90% and *Proteus sp.* for 15.49% of the positive isolates found in urine samples.

This agrees with the findings of MMDT (4) that about 40% of UTIs are caused by gram negative species. That *Trichomonas vaginalis* was found in 12 (5.63) of HVS samples agrees with the reports of Johnson (16) which says that this organism usually causes infection when the normal acidity of the vagina is disturbed or when sexually transmitted from the urethra of males. *Candida sp.* was found in 18 (8.45%) urine and 39 (19.31%) HVS samples. This could have resulted from prolonged antibiotic therapy, diabetes, and/or use of oral contraceptives (16).

Of the 204 positive isolates, 72 (33.80%) had a previous history of UTI and had been treated. 66 (30.99%) of them still had UTI symptoms while 6 (2.82) were negative (table 2). This implies that the previous infections were either not treated properly or the infections were chronic or recurrent. This agrees with Dorth (3) who suggested that UTIs could either be symptomatic or asymptomatic, acute, chronic or recurrent, complicated or uncomplicated (3).

Based on age distribution, the result shows that the age groups 15-19 and 20-24 years had a high prevalence of UTI (table 3). This agrees with the suggestions of O'Donnell (6). Cases of mixed infections as recorded in table 4 could have originated from gastro-intestinal or genito-urinary fistulae, bladder outlet obstruction, neurogenic bladder and indwelling catheters. Infection could have also possibly occurred despite precautions taken to prevent it.

The high prevalence of pathogenic organisms observed in the urine and HVS samples in this study may have resulted from the unclean state of sanitary environments in the hostel, as well as careless and dirty habits among the students, probably due to damaged toilet and bathrooms. Improper use of the environment could result to infections because female urine is ejected with force and creates great splashes which could re-introduce pathogenic organisms from the environment into their urinary opening. Reduced fluid intake which helps to keep the bladder active and bacteria free could also have enhanced their susceptibility to these pathogenic organisms.

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