

## Incidence Of Urinary Tract Infections Among Patients Who Attended University Of Port Harcourt Teaching Hospital, Choba

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**Abstract:** Incidence of urinary tract infections (UTIs) among patients who attended the University of Port Harcourt Teaching Hospital (UPTH), Choba, Rivers State, Nigeria for healthcare services was investigated. A total of 100 samples of mid-stream urine were aseptically collected using a sterile wide leak-proofed container and transported to the laboratory for microbiological analyses. Antibiotics susceptibility test was performed to determine susceptibility and resistance of isolates to selected conventional antibiotics using peptone water. Results obtained indicated that 75.7% (males) and 84.7% (females) had UTIs. Furthermore, 86.6% of males aged 16 to 20 and 66.6% aged 21 to 25 years had UTI. For females, 79.4% aged 16 to 20 and 87.1% aged 21 to 25 years had UTI. However, the results indicated that there was no significant difference ( $P>0.05$ ) among the male and female subjects aged 16 to 20 and 21 to 25 years. Bacterial isolated includes *Escherichia coli* 22(43.14%), *Klebsiella* spp. 13 (25.49%), *Staphylococcus aureus* 9(17.65%), *Proteus* spp. 3(5.88%) and *Pseudomonas* spp. 4(7.84%). *Escherichia coli* and *Klebsiella* spp. were predominant. The susceptibility of isolated organisms was higher with gentamycin followed by ciprofloxacin. These are known therapeutic drugs for treating UTI and should be administered properly. It is recommended that Ceporex, Nalidixic acid, Rifampicin and Levofloxacin in which isolates shown resistant to be removed from the markets.

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### 1.

#### Introduction

The urinary tract is comprised of kidney, ureters, bladder, and urethra. When bacteria from the rectal area enter the urinary tract via the urethra to the bladder and multiply in the urine, an infection occurs. Normally urine is sterile. It is free from bacteria, viruses and fungi but does contain fluids, salts and waste products of metabolism (Wyngaarden *et al.*, 1992; Komala and Sampath Kumar, 2013).

An infection limited to the urethra is called urethritis. If bacteria move to the bladder and multiply, a bladder infection called cystitis. If the infection is not treated promptly, bacteria may then travel further up to the ureters to multiply and infect the kidneys, called pyelonephritis.

A urinary tract infection (UTI) is an infection caused by pathogenic organism such as bacteria, fungi, or parasites in any structures that comprise the urinary tract (Komala and Sampath Kumar, 2013; Rubin *et al.*, 1992). UTI is the common type of bacterial infection in humans irrespective of their age or sex (Hooton and Stamm, 1997), and one of the leading cause of healthcare expenditure for of all age

groups (Vasquez and Hand, 2004; Solomon *et al.*, 2014).

UTI are common complaints resulting from ascending infection by Gram negative, enteric bacteria, such as *Escherichia coli*, *Klebsiella Pneumoniae*, *Proteus Mirabilis*, *Enterococcus* spp. and *Pseudomonas aeruginosa* (Komala and Sampath Kumar, 2013). Although *Escherichia coli* is considered as the predominant isolate causing urinary tract infection, few authors have reported changing patterns in their prevalence of uropathogens (Omoriegie *et al.*, 2008) with urinary pathogens from community patients having strains that are resistant to many commonly used antibiotics (Hay Cook, 1991; Orrett, 2001; Solomon *et al.*, 2013).

The most frequent chief complaint with urinary tract infection is dysuria. Other aspects to inquire about incidence urgency, frequency are nocturia, gross hematuria and any changes in the colour and/or consistency of the urine. Urethra catheterization appear to be the highest risk of UTI with 10 – 30% developing UTI and 3 – 10% daily incidence of bacteria (waters, 1969). UTI affects 2.6 to 3.4% of children in the United States annually throughout

childhood; the risk of UTI is 2% for boys and 8% for girls (Hay cock, 1991). The bacteria most associated with UTI are usually of fecal origin.

The term incidence of urinary tract infection usually refers to the occurrence of new cases of a disease or condition (Le and Boen, 1995). Incidence is calculated as the number of time of new cases of a disease or condition in a specific time period (usually a year) divided by the size of the population under consideration who are initially disease free. A telephone survey in Nigeria showed that 11% of women 18 years or older reported at least one presumed UTI during the previous years and as estimated, 60% of all hospital acquired infection are due to urinary tract infection (Andrew *et al.*, 2000).

Comparatively the incidence of UTIs in males decreases after 2 years of age (Singh-Grewal *et al.*, 2005; Shaikh *et al.*, 2008). UTI may be symptomatic (SUTI) or asymptomatic (AUTI) (Stamm and Hooton, 1993; Nicolle, 2003). AUTIs occur when urinary tract pathogens enter into the pathogen without causing apparent symptom. Such pathogens are typically eliminated by the human defense system if they persist only for a short time, but when the pathogen stays in the urinary system for a long time, SUTI may result (Ariyo *et al.*, 2004; Adeyeba and Ojeaga, 2002). Available literature does show that a significant bacterial count in the urine, usually  $10^5$ cfu/ml in an individual without symptoms of UTI (smith, 1994), is termed asymptomatic bacteriuria.

However, this has changed from  $\geq 10^5$  bacterial/ml urine before 1992 to  $\geq 10^4$  bacteria/ml urine in order to accommodate the representation of slow growing bacteria like *Enterococci* and Coagulase-negative *staphylococci* (Grude *et al.*, 2001). Above all AUTIs are associated with an increased risk of developing pyelonephritis, maternal and infant morbidity, preteen labour and low birth weight (Oyagade *et al.*, 2004). According to Water (1969), most of the purulent urethritis is sexually transmitted.

The inflammation and infection is limited, to the urethra. It is usually transmitted sexually and pathogens such as *Chlamydia trachnomatis*, *Ureaplasma urealyticum*, *Neisseria gonorrhea* or *Trichomonas vaginalis* are common causes of urethritis (Nicolle, 2004). Infections of lower urinary tract are generally accompanied by less severe symptoms than pyelonephritis (Grude *et al.*, 2001). Symptoms include: painful urination (Urethritis) increased urinary frequency, awakening at night to urinate (nocturia), heaviness or tenderness in lower abdomen, blood in the urine (hematuria), fever back pain, abdominal pain, nausea and vomiting, tiredness or weakness, cloudy and foul smelling urine (pyrexia).

It is more difficult for the adults to build up an immune response to the infection (Nicolle, 2004). Symptoms in adult include: painful urination (urethritis), increased urinary frequency, wakening at night to urinate (nocturia), heaviness or tiredness in the lower abdomens, blood in the urine (hematuria), fever, backpain, abdominal pain, nausea and vomiting, tiredness or weakness, cloudy and foul smelling urine (pyrexia)(Komala and Sampath Kumar, 2013).

Symptoms of UTI depends on the child's age, new borns and children under the age of two (2) who have UTI often only have a fewer symptoms. Some of these symptoms may include: urge to frequently urinate, often in small amounts, cloudy urine, dark or bloody urine abdominal pain, fever and vomiting. Lifestyle changes may help prevent some UTIs (Wyngaarden *et al.*, 1992). After menopause, a woman may use estrogen cream in the vagina area to reduce the chance of further infections. UTIs can be prevented by bathing and hygiene: Choose sanitary pads instead of tampons, do not douche or use feminine hygiene sprays/powders, do not use product containing perfumes in the genital area, take shower instead of baths, keep your genital area clean, clean your genital and anal areas before and after sexual activity, urinate before and after sexual activity, wipe from front to back after using the bathroom.

Also, during diet, drink plenty of fluids (2 to 4 quarts each day, do not drink fluids that irritate the bladder such as alcohol and caffeine (Komala and Sampath Kumar, 2013). Acupuncture has been shown to be effective in preventing new infection in recurrent cases. One study showed that UTIs occurrence was reduced by 50% for 6 months. However the study has been criticized for several reasons: acupuncture appears to reduce the total amount of residual urine in the bladder; all of the studies were done by one research team without independent reproduction of results (Iravani, 1991). The study therefore, investigated the incidence of urinary tract infections (UTIs) among patients, who attended the University of Port Harcourt Teaching Hospital (UPTH), Port Harcourt.

## 2. Materials and Methods

### 2.1 Sample collection

Samples of mid-stream urine were aseptically obtained from patients who attended University of Port Harcourt, Nigeria using a universal container. A total of 100 samples were obtained and adequately labeled to reflect the sex and number of samples. Physical examination (Macroscopy), microscopy, urinalysis tests were carried out based on Biochemical Testing of Microorganisms and Medical Laboratory Manual for Tropical Countries (Cheesbrough, 2004). Culturing was done using CLED (Cystine Lactose

Electrolyte Deficient agar) and nutrient agar plates. The inoculated plates were incubated at 37°C for 24-48h and plates examined.

## 2.2 Antibiotic sensitivity test

Antimicrobial susceptibility test was determined using the standard agar diffusion method on Iso sense agar (Akinyemi *et al.*, 1997; Gadd, 2008). Overnight cultures of the isolates were inoculated into peptone water and spread onto the surface of the Iso sense agar plates. Gram positive and negative discs were aseptically placed on the agar plate and plates incubated at 37°C for 24h. The degree of susceptibility of the test isolate to each antibiotic was determined by measuring zones of inhibition. Data obtained from this study were analyzed using the statistical package for social sciences (SPSS) version 18.0 for windows. Independent sample T-test values were considered not statistically significant at  $P > 0.05$  (Agwung – Fobellah, 2007).

## 3. Results and Discussion

The distribution of bacterial isolates associated with the incidence of UTIs among patients who attended UPTH is as represented in Table 1. The percentage occurrence of all isolates gave the following results: *Escherichia coli* 22(43.14%), *Klebsiella* spp. 13(25.49%), *Staphylococcus aureus* 9(17.65%), *Proteus* spp. 3(5.88%) and *Pseudomonas* spp. 4(7.84%). *Escherichia coli* and *Klebsiella* spp. were predominant. These results are in agreement with the report of Mackie (1989) who observed that Gram negative bacteria especially *Escherichia coli* was the commonest pathogen associated with UTIs. These bacterial have also been isolated from public restrooms in University of Port Harcourt (Agbagwa and Nwechem, 2010).

**Table 1: Bacterial isolates associated with the incidence of UTI among patients**

Isolate	Male	Female	Total	Occurrence (%)
<i>Escherichia coli</i>	6	16	22	43.14
<i>Klebsiella</i> spp.	3	10	13	25.49
<i>Staphylococcus aureus</i>	1	8	9	17.65
<i>Proteus</i> spp.	1	2	3	5.88
<i>Pseudomonas</i> spp.	1	3	4	7.84

Bacteria often isolated from UTI include *Escherichia coli*, *Klebsiella Pneumonia*, *Enterococcus* spp. and *Pseudomonas aeruginosa* and in rare cases, the fungus *Candida albicans* (Ozumba, 2005). Most infection has been reported to be caused by retrograde ascent of bacteria from the fecal flora via the urethra to the bladder and kidney (Sheikh *et al.*, 2008).

Urinary pathogens have virulence factor that promotes adherence to mucosal surfaces and subsequent infections resulting from *Neisseria* and *Chlamydia* (Behrman and Kliegman, 2003; Ronald, 2003). The bacterium attaches itself to surfaces with a structure known as the pili which mediate adherence to the epithelial cell receptor. Vagina cell receptivity varies as function of hormonal status (Nicolle, 2004). Bacterial adherence was shown to be higher earlier in the menstrual cycle and in post menopausal women as compared to premenopausal women or post menopausal women who are on estrogen replacement therapy (James *et al.*, 2002). The percentage incidence of UTI among male and female patients that attended UPTH is as shown in Fig.1 and 2. The result shows that 75.7% of the male subjects have UTI while 84.7% of the females had UTI.

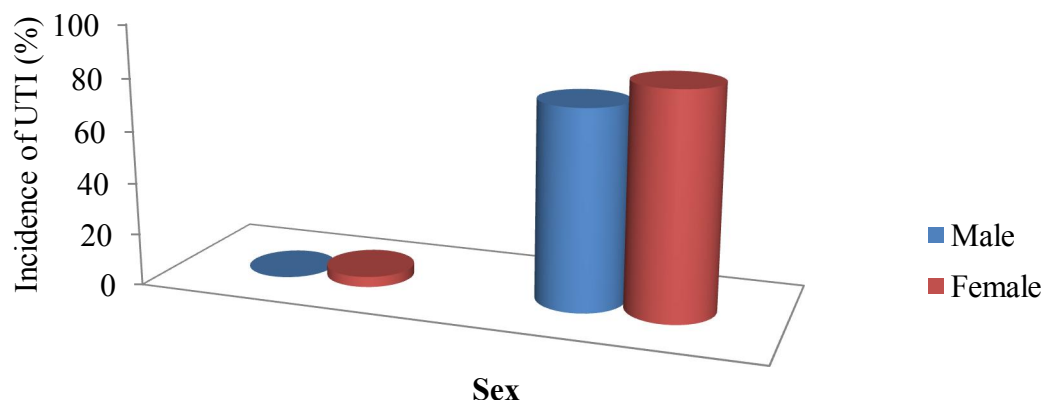
Fig. 2 indicated that 86.6% of the males aged 16 to 20 years has UTI as against 66.6% aged 21 to 25 years while 79.4% of females aged 16 to 20 years has UTI when compared to 87.1% of those aged 21 to 25

years. There was no significant difference ( $P > 0.05$ ) in the incidence of UTI among those aged 16 to 20 and 21 to 25 years respectively. This result is in conformity with the findings of monif (1982) who reported that age and sex are of great significance in the epidemiology of bacteriuria and urinary tract infections and related acquired diseases.

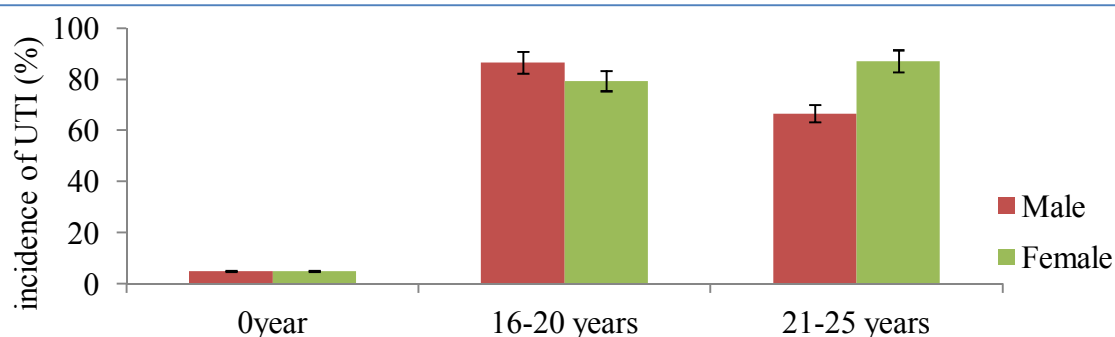
Urinary tract infections (UTIs) can occur in anyone but the incidence varies by age and gender (Krieger *et al.*, 1999). But is the most common genitourinary disease of childhood (Behrman and Kliegman, 2003). Women generally experience urinary tract infection more frequently than men and also have recurrent infections. It is estimated that one in five women experience symptoms from a urinary infection at some point in her lifetime (Water, 1969). UTIs are most commonly in sexually active women and with people living with diabetes. Poor toilet habits predispose one to infections. An infection results from a breakdown in local defense mechanism in the bladder mucosa causing bacteria to multiply. These bacteria cannot be eliminated by normal maturation. The use of urinary catheter in both women and men who are elderly; people experiencing nervous system disorder and people who are unconscious for long period of time may result in an increase of UTI for a variety of reasons (Kartz, 2003). The most common causes of an uncomplicated UTI are bacteria such as

*Escherichia coli*, *Staphylococcus saprophyticus*, and

*Klebsiella pneumonia*.



**Fig.1:** Percentage incidence of urinary tract infection (UTI) among male and female subjects



**Fig. 2:** Percentage incidence of urinary tract infection in subjects of different age bracket

The percentage susceptibility of Gram negative and positive bacterial isolates are as presented in Tables 2 and 3. The bacteria were sensitive to Gentamicin, Ampicillin, Ciproflox, Augmentin, Streptomycin, Peflacin, Amoxil. However, resistance were observed against Ceporex, Nalidixic

acid, Rifampicin and Levofloxacin and this may be as a result of prolonged abuse of the drugs and as a result, the organism must have developed mechanisms for circumventing their mode of action (Ibeawuchi, 2002; Solomon *et al.*, 2013).

**Table 2: Percentage susceptibility of Gram negative bacterial isolates from urine sample**

S/No	Gram negative isolates	OFX	PEP	CPX	AU	CN	S	CEP	NA	SXT	PN
22	<i>Escherichia coli</i>	68	77	100	50	100	59	36	31	45	40
13	<i>Klebsiella spp.</i>	53	61	84	38	100	30	23	0	35	30
4	<i>Pseudomonas spp.</i>	50	50	75	50	100	25	0	25	0	25
3	<i>Proteus spp.</i>	33	0	66	33	100	33	0	0	33	33

Key: Tarivid – OFX, Pelacine – PEP, Ciproflox –CPX, Augmentin –AU, Gentamicin – CN, Streptomycin – S, Ceporex – CEP, Nalidixic acid – Na, Septrin – SXT Ampicillin – PN

**Table 3: Percentage susceptibility of Gram positive bacteria isolate from urine sample**

S/No	Gram positive isolates	CPX	NB	CN	AML	S	RD	E	CH	APX	LEV
9	<i>Staphylococcus aureus</i>	55	33	77	55	44	22	33	33	55	22

Key: Ciprofloxacin – CPX, Norfloxacin – NB, Gentamicin – CN, Amoxil – AML, Streptomycin – S, Rifampicin – RD, Erythromycin – E, Chloramphenicol – CH, Ampiclox – APX, levofloxacin – LEV

Most organisms have already become resistant to commonly used antibiotics thereby making antibiotic therapy ineffective. Effort should be geared towards clearing ineffective antibiotics from the markets and regulating the use of effective ones. The urinary tract is challenged by the ubiquitous presence of pathogens in close proximity. Any factor that enhance bacterial virulence or detract from host defense can predispose to UTI (Hay Cock, 1991).

A number of predisposing factors for UTI includes infrequent voiding, incomplete voiding, sexual activity, use of spermicidal contraception, genetics, hormonal status, diabetes, immunosuppressant (fair, 1977). UTI can affect anyone that is male or female, infant or adult, but women are more susceptible for a number of reasons. First, is as a result of the shortness of the female urethra which predisposes females to infection caused by bacteria from vagina, rectum, or a sexual partner. Males are less vulnerable because their urethra are longer and because prostatic fluid serve as antibacterial shield. The shortness of female urethra gives bacteria quick access to the bladder (Ebie *et al.*, 2001; Komala and Sampath Kumar, 2013).

Antibiotics are used in the treatment of urinary tract infections. These antibiotics are chosen after carrying out the antimicrobial sensitivity test. The antibiotics chosen will depends on several factors which include; the site of the infection either the upper tract or the lower tract, the bacterium causing the infection, any allergies the individual may have to the antibiotics, the severity of the infection either complicated or uncomplicated, the drugs used to treat other similar previous infections, the health care provider knowledge of any antibiotics resistance. Regardless of the drug chosen, it is important that you complete the antibiotic regimen that your health provider has prescribed (Akinyemi *et al.*, 1997).

Many patients stop taking their medication once they feel better, a course of action that medical practitioners and pharmacists strongly discourage because it can allow an infection to recover with even greater severity within a resistance to the antibiotic and the antibiotics resistant can be spread to members of your family. If no antibiotic is available it fights the bacteria, the consequence can be deadly for the infected individual (Newsam, 2000).

Most uncomplicated urinary tract infection can be treated with oral antibiotic such as Macrobid (Nitrofurantoin), Bactrim (Sephtra or Sulfa), Trimethoprim, Quinolones (Cephalosporin (Keflex), Doxycycline, Levaquin, levofloxacin or Cipro. They are usually taken for 3 days in young adults and 5 days in elderly people (Komala and Sampath Kumar, 2013). In children, UTI should be treated promptly. Neonates require 10 – 14 days of parental antibiotic with bacteremia. Other children with acute cystitis should receive at least 5-7 days course of oral antibiotic therapy (Komala and Sampath kumar, 2013; Solomon *et al.*, 2014).

The most common therapy is administration of amoxicillin or trimethoprim/sulfamethoxazole (Behrman and Kliegman, 2003). In children with pyelonephritis who do not have toxic symptoms, treatment includes a parental antibiotic such as ampicillin, gentamain, co-amoxiclav, cefuroxime, ciprofloxacin (Behrman and Kliegman, 2003).

#### 4. Conclusion

The organisms that have been isolated and identified are those that cause urinary tract infection. The dominant causative agent of urinary tract infection encountered was *Escherichia coli*. There is constant need to monitor the susceptibility pattern of common antibiotics to UTI pathogens for better patients' management. From this study, it has been observed that Gentamicin and Ciprofloxacin are promising therapeutic agent for the treatment of UTI.

If any abnormal change is observed in the body while passing out urine, one should immediately report to the hospital for proper examination. Females should clean their vagina front to back and not back to front to avoid infection. Treatment for a UTI should be designed for each patient and usually based on the patient's underlying medical conditions, what pathogen(s) are causing the infection and the susceptibility of pathogen(s) to treatments (antibiotics).

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