

Urinary Tract Infection Among Female Patients in Central Hospital and University of Benin Health Centre, Benin City, Edo State

Z. Omoruyi¹, C.C. Osuoha², T. O. Egunjobi³

^{1,2}Department of Medical Laboratory Science, School of Basic Medical Sciences, College of Medical Sciences, University of Benin, Benin City, Nigeria

³ Department of Medical Microbiology, School of Basic Clinical Sciences, College of Health Sciences, Igbinedion University Okada, Edo state, Nigeria.

*Corresponding author

E-mail: zainab.omoruyi@uniben.edu

Tel.: +2348037002791

Abstract

Background/Objective: Urinary tract infection (UTI) is an infection caused by the presence and growth of micro-organisms anywhere in the urinary tract and is perhaps the single commonest bacterial infection of mankind. This research was aimed to study the prevalence of Urinary tract infection among female patients, their relationship with water contact activities and antibiotic susceptibility in central hospital and University of Benin health centre, in Benin City, Edo State. **Materials and Methods:** A total of 150 urine samples were collected randomly from the patients into sterile universal containers, processed using urine concentration technique and were also inoculated on Blood and Cysteine Lactose Electrolyte Deficient (CLED) agar. Pathogens were isolated and identified using morphology and biochemical characteristics. **Results:** Results showed that 119(79.3%) out of 150 patients had statistically urinary tract infection (P=0.001). *Escherichia coli* 40(33%) showed the most predominant organism isolated followed by *Staphylococcus aureus* within the age group of 41 years and above showed the highest prevalence rate of 91% when compared with other age groups. In relation to frequent contact with natural water bodies, patients that hardly visit water bodies had the highest prevalence of (83%), and was statistically associated (P = 0.001) with the infection. The frequency of sexual activities among the patients was not significantly associated with the infection (P=0.243). Susceptibility pattern of the microbial agents isolated showed that *Escherichia coli* and *Staphylococcus aureus* had the highest susceptibility pattern to the antibiotics while more than 90% of the isolates showed resistance to Ampicillin and cefuroxime. **Conclusion:** Conclusively, the prevalence of urinary tract infection recorded among female patients in this study advocate for enlightenment on the risk factors associated with urinary tract infection.

Keywords: Humans, Female, Urinary Tract Infections

Received: 9th June, 2022

Accepted: 2nd September, 2022

Introduction

Urinary tract infections (UTI) are caused by pathogenic invasion of the urinary tract, which leads to an inflammatory response of the urothelium (1). They are the second most common type of infections in the body, accounting for about 8.3 million visits in the

hospital each year (2). Urinary tract infections are caused by a variety of different organism most commonly bacteria, although fungi and viruses could be involved (1). The most frequent bacteria cause of urinary tract infections in adult women is *Escherichia coli*, which is part of

the normal gut flora. This organism accounts for approximately 85% community acquired Urinary tract infections and 50% of hospital acquired Urinary Tract Infections (1). The *Escherichia coli* cause 75 - 90% of uncomplicated UTI whereas *Staphylococcus saprophyticus* causes an estimated 5 - 15% of UTIs frequently in younger women (3). Anatomically, urinary tract infection (UTI) can be classified into lower urinary tract infection, which is an infection of the lower part of the urinary tract (the bladder and urethra) and the upper urinary tract infection, which is an infection of the upper part of the urinary tract (the kidneys and ureters). The upper UTI is potentially more serious than the lower one because there is a possibility of kidney damage (4). When the infection is localized at such single sites as urethra, it is known as the urethritis or restricted to the bladder as Cystitis and to the prostate as prostatitis. It affects both old and young leading to a number of deaths either from acute infection or from chronic renal failure (5). Non bacterial infections are less common and tend to occur more often in immunosuppressed individuals or those with diabetes mellitus. Fungal infections with *Candida* species are the most common non bacterial infections (1). The incidence of urinary tract infections is greatly influenced by age, sex and by other predisposing factors that impair the defense mechanism that maintain the sterility of the normal urinary tract (6). The incidence of the infections is high in women (20 - 50%) of who will suffer a clinical episode during their life time. This high incidence is because of the anatomical nature of their reproductive organ (5). Host factors such as changes in normal vaginal flora may also increase the risk of UTI. However, sexual activity in sexually active women is the cause of 75 - 90% of bladder infections, with the risk of infection related to the frequency of sex (4). Genetic factors, including expression of HLA-A, and Lewis blood group Le (a-b-) or Le (a+b-), may also expose women at higher risk for recurrent UTI. As well as post-menopausal

women that lack estrogen, which is essential to maintain the normal acidity of vaginal fluid. This acidity is critical to permitting the growth of lactobacillus in the normal vaginal flora, which acts as a natural host defence mechanism (7).

Most UTI are caused by bacteria that can live in the digestive tract, the vagina or around the urethra. Infections occur when such bacteria enter the normally sterile urinary system and multiply there. They produce enzymes which help them feed on tissues of the host and thus damage them. Poor toilet habits and pregnancy in women can predispose one to infection (4). The etiological and clinical presentation of UTI is similar in both industrialized and developing nations but the range of infections varies from place to place (8).

It is therefore necessary to carry out an investigation of the prevalence and causes of UTI among female patients of some tertiary hospitals in Edo state, Nigeria. This assessment will enhance the policy guidelines on diagnosis and antibiotic treatment of the infection.

Materials and methods

Study area and population

Central Hospital is located in Oredo Local Government Area, longitude 5° 37E and 15° 26E and latitude 6° 19N and 58° 83N, with an area of 249km² and a population of 295, 818 inhabitants. The University of Benin, (UNIBEN) Health Centre is in Egor L.G.A, with a population estimated at 258,442 inhabitants and lies between longitudes 5° 34E and latitude 6° 23N (9). The main occupations of the people in these local government areas include trading, farming and private transport system.

Ethical approval

Approval for this study was obtained from Ministry of Education, Benin City, Edo State, Nigeria. Prior to this research, Informed consent was sought and obtained from the female participants. Each patient was given a labelled questionnaire with the same number as the specimen container given.

Materials used

The following materials and apparatus were used for the bacteriological analysis: Cysteine Lactose Electrolyte Deficient (CLED) agar, blood agar, nutrient agar, universal containers, test tubes, normal saline, autoclave, weighing balance, Bunsen burner, microscope, wire loop, glass slides, rack, cover slips, human plasma, hydrogen peroxide, crystal violet, lugol's iodine, acetone, neutral red, sensitivity disc, kovac's reagent, oxidase reagent and filter paper, citrate media, urea media and peptone water.

Sample collection

Prior to urine collection, the female patients were instructed on how to collect the urine sample using the mid-stream catch technique. Ten millilitres (10ml) of 150 mid-stream urine samples were collected in sterile universal containers from the patients. The samples were transported immediately to the laboratory for analysis. However, in unavoidable circumstances of delay, they were stored at a temperature of 4°C (for not more than 2hours).

Sample examination

About 5mls of each of the well mixed urine sample was transferred to a labelled conical tube and centrifuged at 3000rpm for 5mins. The supernatant was discarded and the deposit resuspended by tapping the bottom of the tube. The urine deposit was culture using blood agar and Cysteine Lactose Electrolyte Deficient (CLED) agar by streaking method. The inoculated plates were examined for growth and the colonies were isolated and identified using biochemical test like Gram staining, catalase test and coagulase test as described by. The identified isolates were subjected to antibiotic susceptibility tests (10).

Statistical analysis

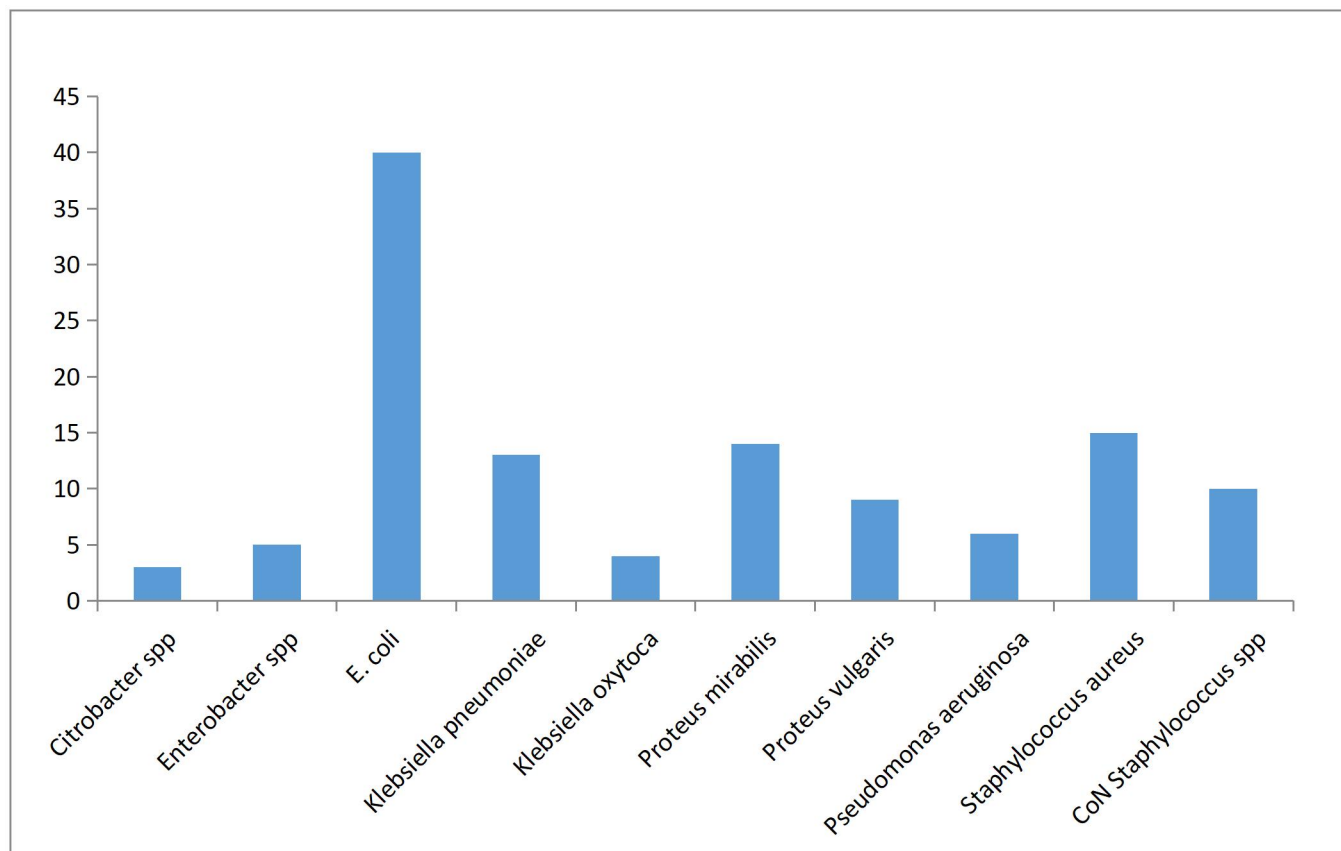
Statistical analysis was performed using SPSS version 20 software for significant relationship between urinary tract infection and water contact activities. Chi-square test was carried out and differences were considered significant at values of $P < 0.05$.

Results

A total of one hundred and fifty (150) urine samples were collected from female patients with age range 10 to 41 years and above. Out of the 150 female patients urine samples examined, 79.3% prevalence was found to have significant growth using standard bacteriological procedure. The highest prevalence was found in Central Hospital 91(86.7%) than UNIBEN Health Centre 28(62.2%) (OR=0.253; 95% CI=0.111, 0.578; P=0.001) Table 1. *Escherichia coli* was the most predominant organism isolated 40(33%), followed by *Staphylococcus aureus* 15(13.0%), *Proteus mirabilis* 14(12.0%), *Proteus mirabilis* 13(11.0%), while *Citrobacter species* was the least organism isolated 3(3%), Figure 1. Table 2 shows Age group 41 years and above were the most infected 50(91%), followed by age group 31- 40 years 33(82.5%), and 21-30 years 30(67%). Age of the subjects show statistical significance (P = 0.010). The subjects that do not have frequent water activities were more, although this was significantly associated (P = 0.001) with UTI (Table 3). The prevalence of urinary tract infection in relation to frequency of sexual activities was higher amongst females with Seldom 38(83.0%) and frequent 56(82.0%) sexual activities respectively. This did not show any statistical significance (P = 0.243) (Table 4). The susceptibility profile of *Escherichia coli* isolated showed highest sensitivity (100%) to Ciprofloxacin and Nitrofurantoin antibiotics respectively and highly resistance (8.0%) to Cefazidime and Cefuroxime antibiotics respectively (Table 5).

Table 1: Prevalence of UTI in relation to location

Location	No. Examined	No. infected (%)	Odd ratio	95% CI	P- value
Central Hospital	105	91 (86.7)	0.253	0.111 – 0.578	0.001
UNIBEN Health Center	45	28 (62.2)			
Total	150	119 (79.3)			

**Figure 1: The prevalence of different bacteria isolates among the female patients****Table 2: Prevalence of urinary tract infection in relation to age**

Age Group (years)	Number examined	Number infected (%)	P-value
10 – 20	10	6 (60%)	0.010
21 – 30	45	30 (67%)	
31 – 40	40	33 (82.5%)	
41 and above	55	50 (91%)	
Total	150	119 (79.3%)	

Table 3: Prevalence of UTI among Age group in relation to water contact activities

Water contact activities	Age range				p-value
	10 -20	21 -30	31 – 40	>40	
Washing clothes, Utensils etc	-	-	-	-	0.001
Washing arms and legs	-	2(33%)	-	-	
Collecting water	-	-	1 (33%)	-	
Mixed (Bathing, playing and swimming)	-	3 (33%)	3 (43%)	3 (42%)	
No frequent contact with water bodies	6(67%)	25(83%)	29(97%)	47(98%)	

Table 4: Prevalence of UTI in relation to frequency of sexual activities

Frequency of sexual activities	Number Examined	Number Infected (%)	P – value
Seldom	46	38 (83%)	0.243
Often	36	25 (69%)	
Frequent	68	56 (82%)	

Discussion

The prevalence of Urinary Tract Infection (UTI) among female patients in the study area is 79.3%. This prevalence is higher than the value (65%) reported in Ado Ekiti, Nigeria (3). However, Central hospital had the higher prevalence 91(86.7%) and it was significantly associated with the infection ($P = 0.001$). The high prevalence observed in this area could be due to high attendance of patients in less expensive state government hospital.

In this study *Escherichia coli* (40%) were noted as the most common bacteria isolated followed by *Staphylococcus aureus* (15%). This is similar to the studies carried out in Ado Ekiti (3), Edo state (11) and Ebonyi state (4), that observed *Escherichia coli* as the most isolated microorganism. This contradicted the study by (12), which has *Klebsiella* spp as the common isolated bacteria. This dissimilarity could be due to the participants (female patients and febrile infants respectively).

The patients within the age group 41 and above years representing 91% study population had the highest prevalence of UTI than the younger age groups 10 to 20 years (60%). This is however, not in total agreement with a few works done previously on urinary tract infection (UTI) by (13) that showed that peak infection occurs in women aged 18 to 24 years and (14) reported infection occurs in women

between 16 and 35 years of age. This disagreement is attributed to the fact that the infection may be asymptomatic for years and that the study was carried out on a sample of patients visiting the central hospital and University Healthcare Centre as against a general population in most of the previous works. Also, it is notable in this part of the world that most people seek the attention of health care professionals only when there are symptoms of ill health.

In relation to water contact activity, the highest prevalence was shown by those that hardly visit water bodies. The reason for this cannot be attributed to a single factor. It could be lack of insufficient literature which establishes water activities as a risk factor of urinary tract infection. Secondly, from the demographic data collected, a larger proportion of our subjects inhabit in the city where the major water bodies are swimming pools.

The data obtained for prevalence in relation to frequency of having sexual activities shows that 83% of those who seldom have sex have UTI, while 69% of those who often have sex are positive of the infection and 82% of those who have sex frequently are infected, with ($p = 0.243$) which was statistically not significant. This finding agrees with (6), which related that frequent sexual activity is the cause of 75-90% of UTI amongst sexually active women. It was observed that the susceptibility of the

isolates to the antibiotics used differs with the species. A remarkable results was observed with Ciprofloxacin been more sensitive (100%) to the isolates. This result is comparable with the findings of other studies that reported the success of ciprofloxacin, due to its broad spectrum activities, its bactericidal activity on organisms both in replicating and resting state and its ability to disrupt DNA functions leading to the death of the bacterium (15).

Conclusion

A prevalence of 79.3% Urinary Tract Infection among female patients in the Central hospital and the University of Benin, in Benin City were observed. The most prevalence isolate was *Echerichia coli* (40%). Increase in age, Water contact activities and location variation strongly affected the prevalence of UTI among female patients in the studied areas ($P < 0.05$). Sexual activities greatly influence the

prevalence of Urinary tract infection. Prescription of drugs in line with laboratory findings is strongly important due to the poor antibacterial susceptibility of some of the drugs used.

Recommendation

There is need for educating females on the risk factors associated with UTI and the preventive measures needed to avoid the disease. Abuse of antibiotics should be discouraged as this leads to drug resistance by bacteria. Periodic screening of women in both rural and urban areas for urinary tract infections is highly recommended. Since hospital environment is a sort collection agency for many pathogenic microorganisms by virtue of the many seriously ill patients who passes through it, therefore, it is extremely important for the hospital managements to do everything possible to minimize the spread of these organisms to other patients.

Table 5: Antimicrobial susceptibility pattern of isolates

Isolates	ANTI MICROBIAL AGENTS								
	N	AUG	CAZ	CPR	CRX	AMP	GEN	OFL	NIT
<i>Citrobacter specie</i>	3	Nil	Nil	3 (100%)	Nil	Nil	Nil	Nil	3 (100%)
<i>Enterobacter species</i>	5	Nil	1 (20%)	4 (80%)	Nil	Nil	1 (20%)	5 (100%)	1 (20%)
<i>Escherichia coli</i>	40	6 (15%)	3 (8%)	40 (100%)	3 (8%)	3 (8%)	10 (25%)	20 (50%)	40 (100%)
<i>Klebsiella pneumonia</i>	13	6 (50%)	Nil	13 (100%)	Nil	Nil	5 (38%)	8 (62%)	5 (38%)
<i>Klebsiella oxytoca</i>	4	Nil	Nil	4 (100%)	Nil	Nil	2 (50%)	4 (100%)	Nil
<i>Pseudomonas aeruginosa</i>	6	2 (33%)	Nil	3 (50%)	Nil	Nil	2 (33%)	Nil	3 (50%)
<i>Proteus mirabilis</i>	14	1 (7%)	1 (7%)	9 (64%)	Nil	Nil	2 (14%)	14 (100%)	7 (50%)
<i>Proteus vulgaris</i>	9	Nil	Nil	6 (67%)	Nil	Nil	Nil	9 (100%)	5 (56%)
<i>Staphylococcus aureus</i>	15	5 (33%)	Nil	15 (100%)	Nil	Nil	7 (47%)	12 (80%)	5 (33%)
Coagulase negative <i>Staphylococcus</i>	10	Nil	Nil	10 (100%)	Nil	Nil	3 (30%)	10 (100%)	10 (100%)

Key: N: Number examined, AUG: Augmentin, CIP: Ciprofloxacin, GEN: Gentamicin, CAZ: Ceftazidime, CRX: Cefuroxime, AMP: Ampicillin

OFL: Ofloxacin, NIT: Nitrofurantoin

References

1. Scott, J.H., Gregory, G.A., Karen, W.D and Thomas, M.H. (2004). Intracellular bacterial Communities of Uropathogenic *Escherichia coli* in Urinary Tract Pathogenesis. *TRENDS in Microbiology*. 12(9), 424-430.
2. Ramesh, H and Aggarwal, K.K. (2012). Tract infections in Women. *Indian Journal of Clinical Practice*; 23(4): 187-192.
3. Ojo, O.O. and Anibijuwon, I.I. (2010). Urinary Tract Infection among female students residing in the campus of the University of Ado-Ekiti, Nigeria. *African Journal of Microbiology Research*; 4(12): 1195-1198.
4. Ani, O.C., Odeta, M.P., Onwe, S.O. (2016). Burden of Urinary Tract Infection (UTI) among Female Students: South Eastern Nigeria Side of the Story. *International Journal of Tropical Disease & Health*; 12(2):1-7.
5. Katz, A.R. (2003). Urinary tract infections and acupuncture. *American Medical Journal of Public Health*; 9: 702-723.
6. Ani, O.C. and Mgbechi, E.K. (2008). Prevalence of Urinary Tract Infection (UTI) in sexually active women of Abakaliki, Ebonyi State, Nigeria. *Animal Research International*; 5(2): 876-879.
7. Minardi, D., D'Anzeo, G., Cantoro, D., Conti, A., Muzzonigro, G. (2011). Urinary tract infections in women: Aetiology and treatment options. *International Journal of General Medicine*; 4: 333-343.
8. Latif, A.S. (2004). Urogenital infections in the tropics. *The Australasian College of Tropical Medicine Publishing Press*; 60-65.
9. Ministry of Land and Survey (2008). Edo State Ministry of Land and Survey Annual Report, pp 122.
10. Clinical and Laboratory Standards Institute (2007). Performance standards for antimicrobial susceptibility testing; 17th informational supplement, Pp. 5-11.
11. Raphael, M.M., Moghene, E.B., Odjajare, E.E., Enabulele, S.A. and Umeh, O.J. (2015). Prevalence of urinary tract infections among pregnant in University of Benin teaching hospital, Benin city, Edo state, Nigeria. *Journal of Asian Scientific Research*; 5(4): 198-204.
12. Omoregie, R., Egbe, C.A., Dirisu, J and Ogefere, H.O. (2013). Microbiology of Neonatal septicaemia in a Tertiary Hospital in Benin City, Nigeria. *Biomarkers and Genomic Medicine* 5: 142 – 146.
13. Nicolle, L.E. (2008). Uncomplicated urinary tract infection in adults including uncomplicated pyelonephritis. *Urologic Clinical North American*; 35(1): 1-12.
14. Salvatore, S., Cattoni, E., Siesto, G., Serati, M., Sorice, P., Torella, M. (2011). "Urinary tract infections in women". *European Journal of Obstetrics, Gynaecology, and Reproductive Biology*; 156 (2): 131–136.
15. Karen, E., Dorthe, S., Bettina, L., Suen, F., Stig, H., Tor, M., Rolf, L and Niels, F. (2006). Pulse-field gel electrophoresis typing of *Escherichia coli* strains from samples collected before and after pivmecillinam or placebo treatment of uncomplicated community acquired urinary tract infection in women. *Journal of Clinical Microbiology*. 44: 1776-1781.

Cite this article as: Omoruyi, Z, Osuoha, CC, Egunjobi, TO. Urinary Tract Infection Among Female Patients in Central Hospital and University of Benin Health Centre, Benin City, Edo State *J. Basic Appl Med Sci*, 2022;2(2):01-08