URINARY TRACT INFECTIONS AND ANTIBIOTIC SENSITIVITY PATTERN OF UROPATHOGENS IN A TERTIARY HOSPITAL IN SOUTH WEST, NIGERIA

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ABSTRACT

Background: Urinary Tract Infection (UTI) is one of the factors implicated in morbidity among patients. Early diagnosis and treatment of UTI could be pivotal in overall treatment outcome.

Aims: The aim of this study was to determine the prevalence of UTI, identify common isolates in UTI cases and their in-vitro sensitivity and resistance patterns to common antibiotics.

Methods: This was a retrospective descriptive study of 181patients with microbiological indications for UTI conducted between April 2014 and September 2015.

Results: Out of 181 patients aged 20 to 86 years with a mean age of 51.43±17.2 years, 79(43.6%) had positive bacterial growth for uropathogens. Most common predisposing factors were urethral catheterization (32.5%), Diabetes mellitus (23.7%), and Urinary tract obstruction (18.7%). UTI was found to be more predominant among females (55.7%). The common isolates were *Escherichia coli* 30(37.9%), *Klebsiella pneumoniae* 27(34.2%), *Pseudomonas aeruginosa* 10(12.7%), *Proteus mirabilis* 8(10.1%), *Enterococcus fecalis* 3(3.8%), *Acinetobacter baumanii* 1(1.3%). The isolates were sensitive to Nitrofurantoin and Ciprofloxacin and Ofloxacin while they were highly resistant to Cotrimoxazole and Tetracycline.

Conclusions: UTI is common among patients affecting 43.6% of the participants in this study with *Escherichia coli* being the most common uropathogen. Ciprofloxacin, Ofloxacin and Nitrofurantoin could therefore be recommended as first line of drugs to Clinicians for empirical treatment while awaiting sensitivity results. To prevent the emergence of resistant strains, rational use of drugs is encouraged.

KEY WORDS: Urinary tract infections; Nigeria; Antibiotic Sensitivity; Isolates.

Introduction

Urinary tract infection (UTI) is the pathological invasion of the urinary tract by microorganisms. It poses a major public health problem in terms of morbidity and financial cost. Among urological cases, it has the highest total healthcare cost [1]. UTI is considered as one of the most common bacterial infections acquired in the community and in hospitals [2]. About 50% of women would have experienced symptomatic UTI during their life time while approximately 20% of all UTIs occur in men [3-4]. UTIs are a major complication of diabetes, renal disease, renal transplantation, and structural and neurologic abnormalities that interfere with urine flow [5].

A confirmatory diagnosis of UTI is made through microscopy, culture and biochemical assays. Treatment is then initiated based on the antibiotic susceptibility patterns to the organism isolated.

A major challenge in recent times is the abuse of antimicrobials which poses a major public health problem leading to the emergence and re-emergence of resistant strains.

We therefore set out to determine the prevalence of UTI in the study population, identify common isolates in UTI cases and their in-vitro sensitivity and resistance patterns to common antibiotics.

Materials and Methods

This was a retrospective descriptive study that was conducted at Kidney Care Centre, Ondo (KCC) between April 2014 and September 2015. KCC is a government owned eighteen bedded multidisciplinary hospital that attends to patients with Kidney diseases and other cardiovascular disorders. It is located in the Medical Village of Ondo West Local Government, Ondo State, Nigeria which also houses the Mother and Child Hospital and the Trauma and Surgical Centre.

A proforma was used to extract the socio-demographic data and clinical characteristics of both in patients and out patients that used the centre. The Urine Microscopy, Culture and Sensitivity (M/C/S) results of patients who had clinical indications for UTI were extracted and relevant information documented.

Sample Collection

Patients were instructed on how to collect clean catch mid-stream urine into sterile leak proof universal bottles. The samples were aseptically cultured on appropriate media and incubated. Standard biochemical tests were used for identification of isolated organisms. Antibiotic susceptibility testing was done on identified uropathogens using the Kirby-Bauer antibiotic susceptibility disk diffusion technique [6].

Data Analysis

Data was entered and analyzed using SPSS version 17 package. Frequency tables were obtained for selected variables in the study.

Results

A total of 181 patients were studied out of which 103 (56.9%) were male while 78 (43.1%) were female. They were between ages 20 to 86 years with a mean age of 51.43±17.2years. 79(43.6%) samples had positive bacterial growth while 102(56.4%) yielded no growth. Among those with positive bacterial growth, 46(58.2%) were female and 33(41.8%) were male, the ratio of female to male is 1.4:1. It was observed that infections were more common among patients between ages 30-49 with a total of 11(32.4%) in males and 18(40%) in females (Table i)

Among prominent risk factors associated with UTI in the study participants, urethra catheterization was most implicated (32.5%) followed by diabetes mellitus (23.7%), urinary tract obstruction (18.7%), previous UTI (17.5%), renal anomalies (8.7%), kidney stones (7.5%) and HIV infection (5.0%) (See Fig i)

The isolates were *Escherichia coli* 30(37.9%), followed by *Klebsiella pneumoniae* 27(34.2%), *Pseudomonas aeruginosa* 10(12.7%), *Proteus mirabilis* 8(10.1%), *Enterococcus fecalis* 3(3.8%) and *Acinetobacter baumanii* 1(1.3%) (See Fig ii).The total Gram negative and Gram positive organisms isolated represented 96.2% and 3.8% respectively.

Among male patients, *Escherichia coli* and *Klebsiella pneumoniae* ranked highest with 12(36.4%) each followed closely by *Pseudomonas aeruginosa* 6(18.2%), and *Proteus mirabilis* 3(9.0%). Among the female patients in ascending order, the lowest occurring organism was *Acinetobacter baumanii* 1(2.2%), *Enterococcus fecalis* 3(6.5%), *Pseudomonas aeruginosa* 4(8.7%), *Proteus mirabilis* 5(10.9%), *Klebsiella spp.* 15(32.6%) and *Escherichia coli* 18(39.1%) (See Fig iii).

Nitrofurantoin had the highest sensitivity with 85.7% while Tetracycline had the highest resistance with 96.7%. Gentamycin and Co-amoxiclav showed average sensitivity of 59.3% and 46.2% respectively (Table ii).

Discussion

UTI is a major source of morbidity and mortality. The prevalence in this study was 43.6%. This is closely related to previous studies done by Otajevwo and Amedu [7] and Ojo *et al* [8] which recorded a prevalence rate of 59.2% and 52% respectively. A study conducted in Abuja by Iregbu *et al* in 2013 [9] and Aiyegoro *et al* in Ile Ife [10] however recorded a lower prevalence of 13% and 11.9% respectively. The variations in prevalence might be due to differences in study populations and in the criteria used by various centres in selecting urine samples for culture.

In this study, UTI was found to be more prevalent in females than males. Different studies have reported female predominance [10-12]. There is a significant association between sex and the positive cases. The higher prevalence rate recorded in females could be due to the proximity of the urethral meatus to the anus, shorter urethra, contraception, pregnancy and sexual intercourse which introduces bacteria into the female urinary tract [13]. Also, the spread of normal flora in faeces from the anus to the vagina from where it may ascend to the bladder could result from poor anal hygiene [14]. In a contrasting report by Otajevwo and Amedu, 2015 [7], a prevalence rate of 57.1% was recorded among males. Even though they stated that the reason for this was not clear they however enumerated the probable causes as lack of circumcision, receptive anal intercourse and HIV infection among their study participants.

Among the isolates, Gram negative organisms constituted 96.2% while Gram positive organisms accounted for 3.8%. This is consistent with the report of a previous author who isolated 86.1% Gram negative bacilli and 13.9% Gram positive bacteria [15].

Escherichia coli was the most predominant isolate causing UTI in this study while *Klebsiella spp* ranked second in prevalence. This is consistent with other studies [5, 16-18] and reiterates the fact that most organisms causing UTI

are from the lower gastrointestinal tract. It is noteworthy that *Enterococcus fecalis* was isolated only in the female population which may be an indication of poor anal hygiene.

Among the age groups, UTI occurred highest in the 30-49years age groups with prevalence of 18(40%) among females and 11(32.4%) among males. This could be because patients in this age group are sexually active. Infections were observed to be higher in male above 70years of age than in female. Some reports have stated that at advanced ages, males have more complicated UTIs and also more drug resistant pathogens than females [19, 20].Urethral catheterization was found to be the most important risk factor in this study implicated in 32.5% of positive cases followed by diabetes mellitus (23.7%) and urinary tract obstruction (18.5%).This is similar to findings by previous studies that described urethral catheterization as the most common factor implicated in pathogenesis of UTI [21,22]. High incidence of UTI has also been described in diabetes mellitus and patients with urinary tract obstruction [23,24].

The uropathogens isolated in this study showed high sensitivity to Nitrofurantoin, Ciprofloxacin and Ofloxacin. The sensitivity to Nitrofurantoin is in tandem with other reports of 97.6% and above 50% sensitivity by Haruna *et al* and Alabi *et al*[25,26]. Ciprofloxin and Ofloxacin were also found to be the most sensitive and effective antibiotics in studies done by Kolawole [5] and Aziz [27].Tetracycline and Cotrimoxazole were found to be highly resistant. In a study conducted at Redeemers University, Nigeria, Tetracycline and Cotrimoxazole were also found to be resistant [28]. This might be due to the abuse of these drugs leading to mutations which may be transferred though bacteriophage or plasmid thereby promoting resistance. The availability of drugs over the counter without the need of a prescription encourages the abuse of drugs. Also, the use of fake and substandard drugs in Nigeria may also be a contributory factor to the emergence of resistant strains [29,30].

Conclusion and Recommendations

The high UTI rate in this study indicates that it may be a health problem in Nigerians with implications on health expenses and quality of life. *Escherichia coli* was the predominant isolate in this study. Also, Nitrofurantoin, Ciprofloxacin and Ofloxacin were found to be the most sensitive antibiotics. Hence, we recommend that these drugs should be the first line of drugs prescribed by Clinicians while awaiting Urine M/C/S results in patients with UTI. Periodic evaluation of the antibiotic sensitivity pattern of UTI pathogens for commonly used antimicrobials should be done while interventions aimed at reducing unnecessary antibiotic use should be encouraged.

Limitation of the study: This study is a retrospective study which is largely dependent on previous documentations.

Statement of human right.

For this type study (retrospective), formal consent is not required.

Informed consent.

For this type of study formal consent is not required.

Disclosure of potential conflicts of interest.

The authors declare that they have no conflict of interest.

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FIGURES

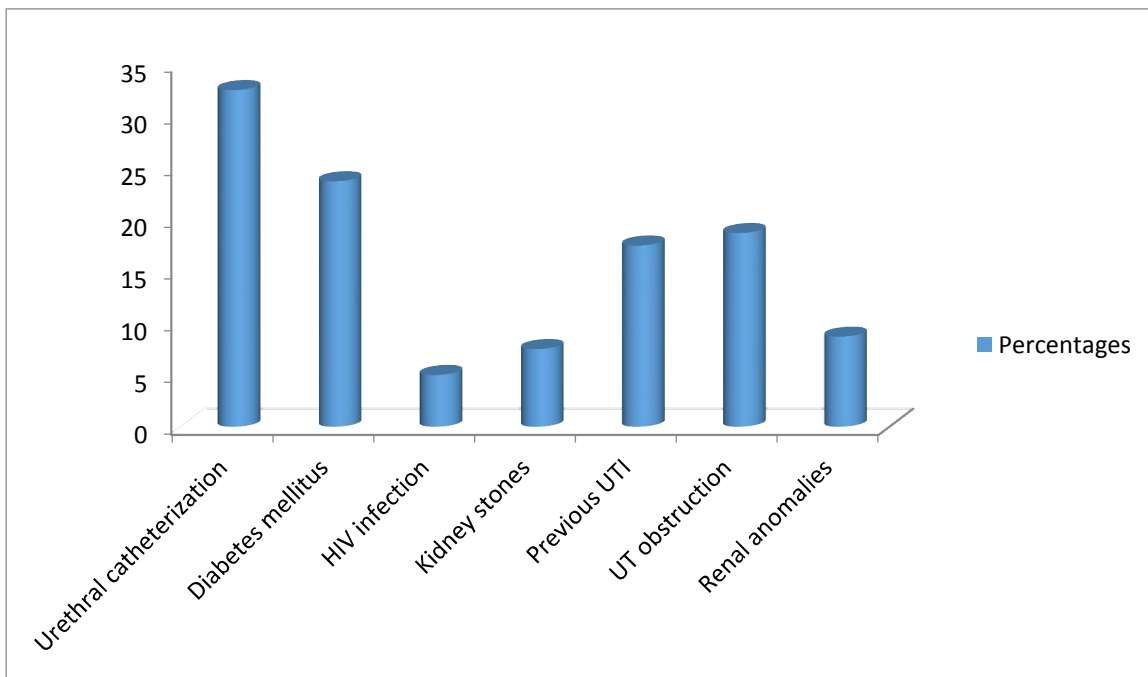**Fig i showing risk factors and percentage with bacterial growth**

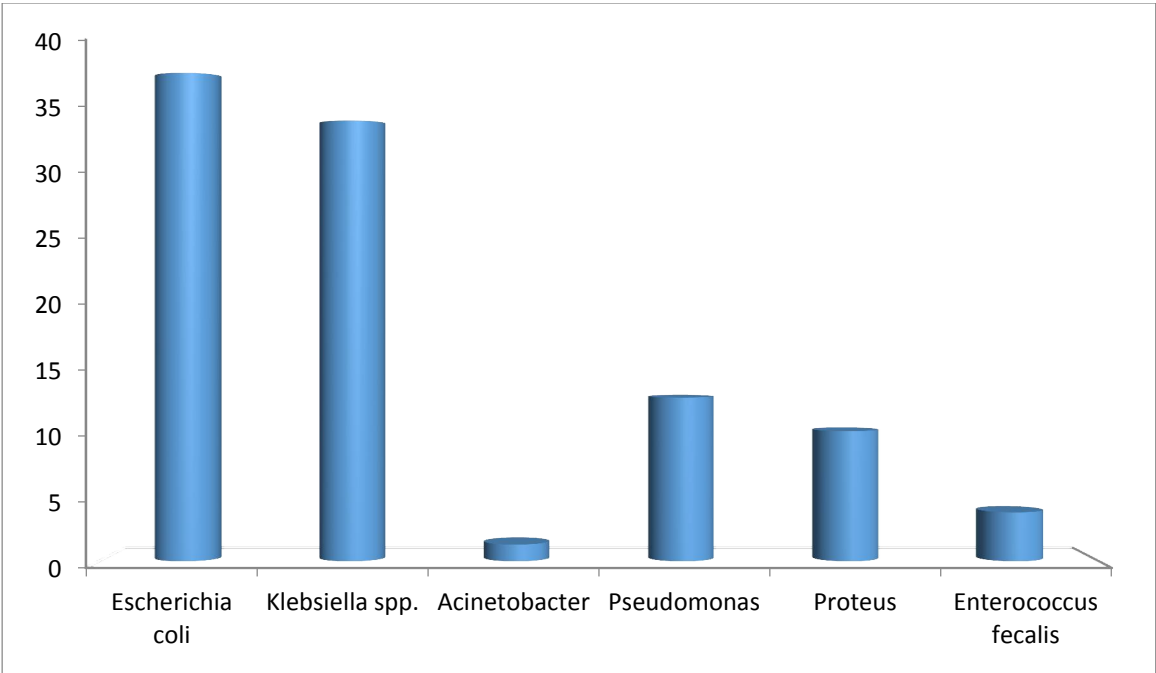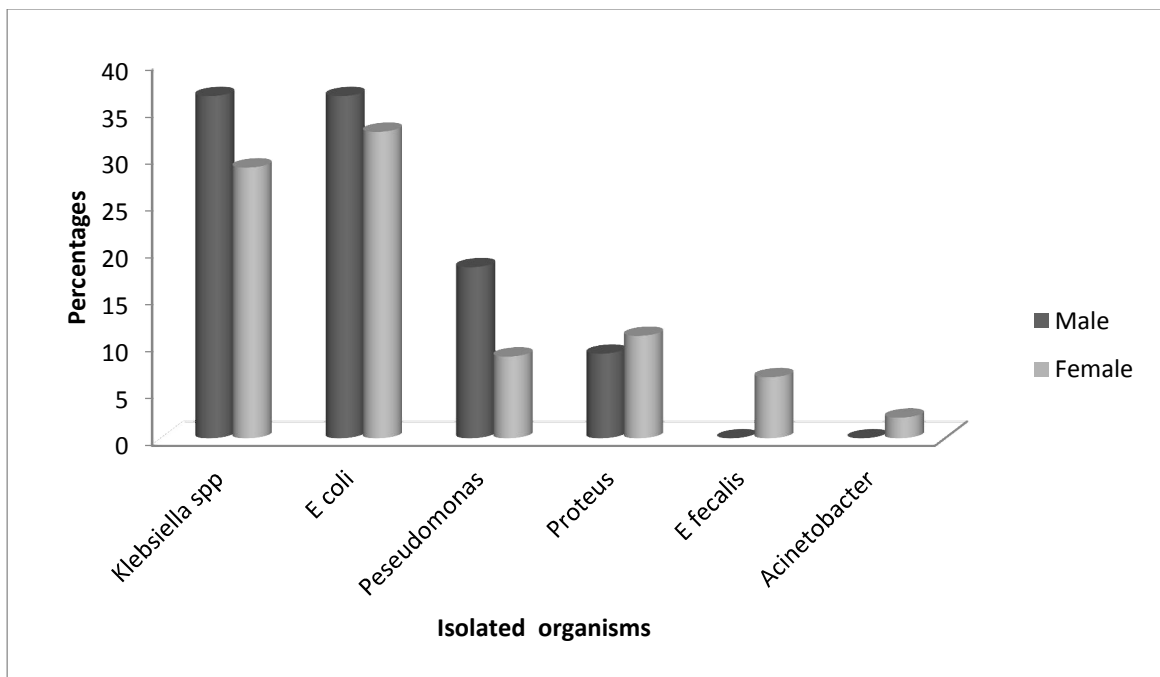**Fig ii showing frequency of isolated organisms**

Figure iii showing the sex distribution of isolated uropathogens

TABLES

Table i showing the age and sex distribution of positive cases

	AGE RANGE (years)			
	20-29	30-49	50-69	>70
Male	3(8.8%)	11(32.4%)	10(29.4%)	10(29.4%)
Female	7(15.6%)	18(40%)	13(28.8%)	7(15.6%)

Table ii showing sensitivity and resistance patterns of some antibiotics used

Antibiotic	% Sensitivity	%Resistance
Gentamycin	59.3%	40.7%
Nitrofurantoin	85.7%	14.3%
Ofloxacin	61.3%	38.7%
Ciprofloxacin	62.8%	37.2%
Co-amoxiclav	46.2%	53.8%
Tetracycline	3.3%	96.7
Cotrimoxazole	6%	94%