Antibiotic Sensitivity Pattern of Urinary Tract Pathogens in Port – Harcourt, Nigeria

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ABSTRACT: The prevalence and sensitivity pattern of urinary pathogens from 1240 patients in Port-harcourt, Nigeria was investigated. The predominant pathogens cultured was *E. coli* which accounted for 76.6% of the infections. *Klebsiella* spp was responsible for 8.1% of cases while the rest were accounted for by *Proteus* spp (4.8%), coagulase-negative staphylococci (3.2%), *Pseudomonas* spp (2.4%), *Enterobacter spp.* (2.4%), *Staphylococcus aureus* (1.6%) and *Citrobacter* species (0.8%). The majority of the isolates were resistant to tetracycline (75.8%), ampicillin (71.0%) and cotrimoxazole (65.3%) but exhibited good sensitivity to nitrofurantoin (88.7%), gentamicin (85.5%) and nalidixic acid (76.6%). It is recommended that a periodic reassessment of the sensitivity pattern of urinary pathogens be carried out to serve as a guide for antibiotic therapy of UTIs in a particular environment since these organisms exhibited resistance to first-line drugs used for UTI infections. @JASEM

Despite impressive advances in the understanding of the pathogenesis, diagnosis and treatment of urinary tract infections (UTIs), these infections still remain a major clinical problem. Many consultations in general practice are because of urinary infections (Sleigh and Timbury, 1986). UTIs, although, less frequently a cause of renal failure, do produce considerable morbidity particularly among young females. UTIs are also an important complication of pregnancy and when associated with structural or neurological lesions of the urinary tract at any age, often lead to severe incapacity and death (Stamey and Pfau, 1970; Kunin 1987; Cunningham *et al.,* 1973; Whalley *et al.,* 1975). The use of antibiotics is clearly widespread in our modern society. Antimicrobial drugs such as tetracycline, sulphonamides and ampicillin which are often used in the treatment of disorders such as gastrointestinal, wound and minor respiratory infections are also the most commonly used drugs in the treatment of urinary infections. Bacteria generally implicated in UTI commonly originate in the intestine (Senewiratne *et al*, 1973; Cattel *et al*, 1974; Sleigh and Timbury, 1986). The extensive use of these drugs, often for infections outside the urinary tract, would alter the antibiotic susceptibility pattern of intestinal bacteria which mostly constitute the bacteria that colonize the urinary tract (Senewiratne *et al*, 1973). Also the rate at which resistance arises among microbial populations is often dictated by the extent of use of particular agents in a given environment (Kabins and Cohen, 1966; Watanabe, 1966; McGowan, 1983; Lambert, 1988; Kunin *et al*, 1990; Jacoby and Archer, 1991). To effectively treat and control infections such as the UTIs in a particular environment, a good knowledge of the antibiotic sensitivity pattern of the causative agents in that environment is therefore of ultimate importance.

There is no organized surveillance of drug resistance among common UTI pathogens in Nigeria, however, few reports available from Ibadan (Adeyemo *et al*, 1994) and Benin (Obaseiki – Ebor, 1988) show that resistance to commonly prescribed antibiotics for UTI exists. The aim of this study was to identify the prevalent UTI pathogens in individuals attending private diagnostic laboratories in the industrial city of Port-Harcourt, Nigeria and investigate their sensitivity pattern to commonly used antibiotics in the environment.

MATERIALS AND METHODS
The study was performed on 1240 patients attending private diagnostic laboratories in Port-Harcourt metropolis, between June 1st, 1995 and May 30th 1996. The laboratories were Auspharm Medical Laboratory Diagnostic Services and Rimot Diagnostic Laboratory, all in Port Harcourt. Only patients who have clinical symptoms of UTI and positive urine culture ($\geq 10^5$ organisms/ml) were studied. The mid-stream urine specimens were obtained by clean – catch method (Kunin, 1987). The samples were collected in sterile universal containers and cultured within 30 minutes of collection. The samples were plated out on MacConkey and blood agar media and incubated aerobically overnight at 37 ^{0}C. Samples that showed pure growth of isolate in a count of $\geq 10^5$ colony-forming units (CFU) per ml of urine after overnight incubation were considered to

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indicate significant bacteriuria (Sleigh and Timbury, 1986; Gerald *et al,* 1990). Identification of organisms was by standard methods while antimicrobial sensitivity tests were carried out by disc diffusion technique (Rapheal*, et al*, 1983) using isosensitest agar (Oxoid, Basingstoke, U.K.). *E coli* strains susceptible to all the antibiotics tested were used as controls.

RESULT

Bacterial organisms were isolated from the urine of 1240 patients during the study. There were 1100 (88.7%) females and 140 (11.3%) males. The male: female ratio was 1:7. 9. The age range of the females

was 16-32 years and that of the males was 18-30 years. The symptoms of the subjects included frequency, dysuria, suprapubic and loin pains. The urinalysis of the patients is as shown in table 1. A total of 1240 isolates were obtained from the patients. The biochemical properties of the isolates are shown in Table 2. The predominant organism was *E. coli* which was responsible for 76.6% of the infection (Table 3). *Klebsiella* was responsible for 8.1% of the infections while the rest were accounted for by *Proteus* spp. (4.8%), coagulase negative staphylococci (3.2%), *Pseudomonas* spp. (2.4%), *Enterobacter* spp. (2.4%), *Staphylococcus aureus* (1.6%) and *Citrobacter* spp (0.8%).

Table 1: Mid-stream urinalysis of patients with acute urinary tract infections (UTIs)

Parameters	Patients with acute examined UTIs. n = 1240
WBC/HPF:	
0 – 4	120
≥ 5	1120
RBC/HPF 0	
PROTEIN:	
Negative 1180	
Trace	40
≥ +	20
GLUCOSE:	
Negative	1240
Trace	0
≥ +	0
CASTS:	
0	1220
≥ 1/HPF	20

WBC/HPF = White Blood Cells per High Power field
RBC   =   Red Blood Cells.

The sensitivity of the isolates to seven antimicrobial agents is shown in Table 3. The three commonest isolates exhibited sensitivity of less than 37% to ampicillin, tetracycline and cotrimoxazole. Most of the isolates were susceptible to nitrofurantoin, gentamicin, streptomycin and nalidixic acid. Nitrofurantoin and gentamicin were effective against over 80% of the strains of *E. coli*, *Klebsiella* spp and
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Proteus spp while nalidixic acid and streptomicin were effective against over 60% of these organisms, (Table 3). The percentage resistance of all the isolates (when considered together) to the different antimicrobial agents is shown in Figure 1. The highest resistance was recorded with tetracycline while the lowest resistance was with nitrofurantoin

Table 2: Biochemical Characteristics of Isolated organisms.

Gram Reaction	No. of Isolates	Motility	Catalase	Oxidase	Coagulase	Indole	Methyl-Red	Voges-Prokauer	Citrate Utilization	H_2S <TSI> Production	Urea Hydrolysis	Oxidation/Fermentation	Nitrate Reduction	Glucose	Sucrose	Lactose	Maltose	Mannitol	Arabinose	Inositol	Xylose	Organisms
														Sugar fermentation								
GNB, small rods	950	+	+	–	ND	+	+	–	–	–	–	F	+	A/G	–	A	A	A	A	–	–	*E. coli*
GNB, small rods	100	–	+	–	ND	–	+	+	+	–	+	F	+	A/G	A	A	A	A	A	A	A	*Klebsiella spp*
GNB, small rods	60	+	+	–	ND	–	–	–	–	+	–	F	+	A/G	A	–	A	A	–	A	A	*Proteus spp*
GPC, in clusters	40	–	+	–	–	–	+	+	+	–	+	F	+	A	A	A	A	A	A	–	A	*Coag. - neg. Staph*
GNB, small rods	30	+	+	+	ND	–	–	–	+	–	+	O	+	A	–	–	–	–	–	–	–	*Pseudomonas spp*
GNB, small rods	30	+	+	–	ND	–	–	+	+	–	+	F	+	A/G	A	A	A	A	A	–	A	*Enterobacter spp*
GPC, in clusters	20	–	+	–	+	–	+	+	–	–	+	F	+	A	A	A	A	A	–	–	A	*Staph aureus*
GNB, small rods	10	+	+	–	ND	+	+	–	+	+	+	F	+	A/G	A	A	A	A	A	–	A	*Citrobacter spp*

GNB = Grams Negative Bacilli
GPC = Grams Positive Cocci
ND = Not Done
Coag. - neg. Staph = Coagulase negative staphylococci

A/G = Acid and gas produced
F = Fermentative
O = Oxidative

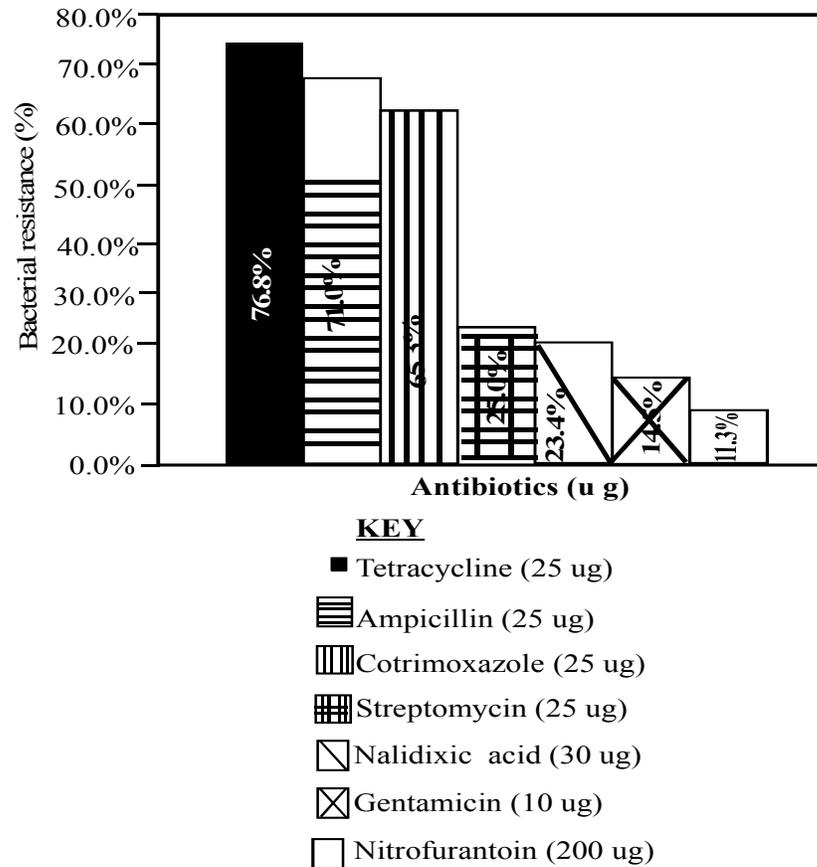A = Acid
+ = Positive
- = Negative

Fig. 1   Percentage resistance of bacterial isolate (causing UTIs) to individual antibiotics

DISCUSSION

The pattern of pathogens causing UTI in Port Harcourt and their antibitic sensitivity pattern is reported. *E. coli* was the most frequent species isolated in this study. This accord with the findings of other workers (Stamey and Pfau, 1970; Senewiratne *et al,* 1973; Pfau and Sacks, 1981; Asseffa and Yohannes, 1996). The percentage sensitivity of the most isolated organisms (*E. coli*, *Klebsiella* spp, and *Proteus* spp) to the commonly used antibiotics for UTI, namely ampicillin, cotrimoxazole and tetracycline was low (Table 3). High incidence of resistance to these drugs has been reported by other workers (Senewiratne *et al*., 1973; Akinkugbe *et al*., 1988;Obaseiki-Ebor, 1988; Aseffa and Yohannes, 1996). In this study, the percentage resistance by *E. coli* to ampicillin, cotrimozaxole and tetracycline are 69.5%, 64.2% and 74.7% respectively. A high percentage resistance by *E. coli* to these antibiotics have been reported by other workers (Senewiratne, *et al.,* 1973; Obaseiki-Ebor, 1988; Adeyemo *et al*, 1994; Aseffa and Yohannes, 1996). Obaseiki-Ebor (1988) in his study in Benin (Nigeria) of 40 isolates of *E. coli* from UTI, found that 80% of the *E. coli* isolates were resistant to cotrimoxazole while Adeyemo *et al* (1994) found a 100% resistance to both cotrimoxazole and ampicillin by the *E. coli* isolates in their study in Ibadan (Nigeria).

In this study, a high sensitivity rate to nitrofurantoin (90.5%), Nalidixic acid (82.1%) and gentamacin (81.1%) was recorded for *E. coli*, the most predominant isolate. Other workers have also recorded a high *E. coli* sensitivity rate to these drugs (Senewiratne *et al*, 1973; Adeyemo *et al*, 1994). The high incidence of resistance to tetracycline, ampicillin and cotrimoxazole (Fig. 1) in the present study may be attributed to the easy access to and indiscriminate use of these drugs in the Port Harcourt metropolis. These drugs are commonly used for infections outside the urinary tract (Senewirante *et al*, 1973) and with this pattern of resistance, it is recommended that cotrimoxazole, tetracycline and ampicillin should not be used as first line agents in the blind treatment of UTIs in the Port Harcourt metropolis. This is more so, as infections caused by resistant pathogens have with them, higher rates of morbidity and mortality than do infections caused by susceptible pathogens (Holmberg *et al*, 1987). Since a very high percentage of isolates in this study were sensitive to nitrofurantoin, this drug would be a better choice for UTI therapy; it could be administered while waiting the culture result.

The appropriate use of antibiotics however with the knowledge of the sensitivity pattern would help reduce the rate of morbidity as well as limit the increasing rate of drug resistance among bacteria. It is the recommendation of this

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study that constant evaluation of the antibiotic sensitivity pattern of UTI pathogens for commonly used antimicrobial agents in a particular environment be carried out

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