

Resistant profile of *Staphylococcus aureus* to commonly prescribed antibacterial agents in patients with urinary tract infection.

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Abstract

Four thousand two hundred and fifty (4250) patients that attended NIPRD Clinic over a period of four years from 2000 to 2004, with clinical symptoms of urinary tract infection (UTI) were screened for possible pathogens. *Staphylococcus aureus*, *Streptococcus sp*, *Escherichia coli* and coliforms were the commonly encountered organisms. The antibiogram was determined using commercially prepared antibiotic disc diffusion method on the urinary pathogens. *Staphylococcus aureus* (36.5%) was the predominant pathogens, followed by *Streptococcus sp*. (10.1%). A combination of *Escherichia coli* and other coliforms gave 8.0%. Among the antibacterial agents recommended for the treatment of these organisms, the 4-quinolones (ciprofloxacin and ofloxacin) were the most effective, with 95.5% of the isolates being sensitive. The drug resistance profile of *Staphylococcus aureus* showed high resistant patterns with the 4- quinolone (5.0%), gentamicin (46%), cephalosporin (64%), ampicillin (83%), nalidixic acid (84%) amoxicillin and nitrofurantoin (89%), tetracycline (93%), and penicillin (95%).

Key words: *pathogens, antibiotics, resistance, urinary tract infection*

Introduction

The pathogens associated in urinary tract infections (UTI) are diverse in pathogenicity (Edgington *et al* 1976; Derrick, 1982). These uropathogens cause cystitis; pyelonephritis and more than ninety per cent of these pathogens are part of the intestinal flora (Cruickshank, *et al* 1980). In UTI, women are frequently infected than men (Cheeseborough, 1991) and are usually the sources of nosocomial infections (Hugo *et al* 1998). The predominant pathogens vary from one location to the other. Akerele *et al* (2000) reported that *Staphylococcus aureus* was predominant bacterium and constituted 36% of the organism isolated from urine. *Escherichia coli* were reported as the commonest cause of UTI (Hugo *et al* 1998, Cruickshank *et al* 1980). The recommended drugs of choice for treating pathogens from urine include ampicillin, cotrimoxazole, nalidixic acid, nitrofurantoin, sulphamide and kanamycin (Cruickshank *et al* 1980). Akelele *et al* (2000) reported that cephalosporins and 4- quinolone were most frequently used drugs in the treatment of uropathogens and that resistance of bacteria to these antibiotics has been on the increase. Obot (1999) reported that the resistance of bacteria in urine to nalidixic acid and ciprofloxacin of 0.2µg/ml has been

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chromosomally mediated.

In this work, we try to establish the prescription pattern of drugs used in the treatment of UTI, the predominant pathogen isolated and its resistant profile.

Material and methods

Patients

4250 patients attending National Institute for Pharmaceutical Research Development (NIPRD) Clinic (Abuja., Nigeria) with complaints of UTI were recruited into the study. Mid-stream urine was collected from each patient in sterile universal container.

Culture Media

Nutrient and MacConkey agar (Biotec) were prepared according to the manufacturer's manual. Blood agar was prepared by adding 2.0ml of whole blood into 18ml of molten nutrient agar maintained at 55°C, mixed and poured into sterile Petri dish and allowed to set.

Antibiotic Disc

Commercially prepared discs (Mast Diagnostics Mast Group UK,) include. Cephalosporins (30ig), Gentamicin (10ig), 4-quinolone (5ig), Erythromycin (10µg), Tetracycline (30ig), Co-trimoxazole (30ig), ampiclox (30ig), Ampicillin (30ig), Penicillin (10U), Nalidixic Acid (30ig), Amoxicillin (30ig), Streptomycin (10ig), Rifampicin (15ig), Chloramphenicol (30ig) and Nitofurantoin (300ig) were used.

Prescription Rate

The frequency of prescription was determined by the antibacterial agent that showed a zone of inhibition of between 18-24mm.

Urine Culture

The patients were each given a sterile urine container and instructed to collect early morning, mid-stream urine, and the sample to reach the laboratory within thirty minutes of collection. The urine was aseptically inoculated into blood and MacConkey agar plates. All inoculated plates were incubated at 37°C for 18 hours. The plates were observed for growth. The bacterial colonies were identified by biochemical and serological tests (8) (3). The antibiotic disc was each applied on the isolates.

Statistical Method:

Percentage and mean were used to analyze the data.

Result.

The frequency at which the uropathogens were isolated is shown in Table 1. *Staphylococcus aureus* was the most frequently isolated organism (36.3%). This was followed by *Streptococcus* sp and *Escherichia coli* with 10.1 and 8.0% respectively. *Klebsiella* sp had 2.30 % frequency of isolation, while *Proteus* sp and Coliforms had 2.10% each. *Candida albicans* and *Pseudomonas* sp had the least frequency of isolation of 2.10 and 1.70%.

respectively. There was no pathogen isolated from 36.6 per cent of the patients. Also 5 to 20% of the patients had more than one organism isolated from them.

The types and frequency of use of the various antibacterial agents in treating UTI is shown in Table II. The cephalosporin (Cefuroxime, Cefotaxime And Cefotaxime) were found to be used most frequently with 13.71% prescription. The Gentamicin and Ampicillin were found to follow with 12.41 and 11.6% respectively. The 4- quinolone and Nalidixic Acid had 8.9 and 5.8% prescription rate respectively. The least prescribed antibacterial agent was Rifampicin with less than 1.0% prescription rate

The resistance profile of *Staphylococcus aureus* to different antibacterial agents is shown in Table 3. The percentage of resistance to Nitrofurantoin, Penicillin, and Tetracycline was 89.0, 96.0 and 93.0% respectively. The resistant profile of *Staphylococcus aureus* to Gentamicin was 46.0% while 4- quinolone had the least resistance of 5.0%. The resistant profile for other pathogens isolated from UTI patients was not studied.

TABLE 1: Isolated pathogens from urine samples

Pathogens	Frequency	% Frequency
<i>Staphylococcus aureus</i>	1540	36.30
<i>Streptococcus sp</i>	430	10.10
<i>Escherichia coli</i>	340	8.00
<i>Klebsiella sp</i>	100	2.30
<i>Proteus sp</i>	90	2.10
Coliforms	90	2.10
<i>Candida albicans</i>	70	1.70
<i>Pseudomonas sp</i>	20	0.50
Mixed flora	220	5.20
No pathogens	1340	31.6

TABLE II: The frequency of prescription of antibacterial agents.

Antimicrobial agents	Frequency	% frequency
Cephalosporins	2850	13.71
Gentamicin	2580	12.41
Ampicillin	2420	11.60
Streptomycin	1860	8.95
4-quinolones	1850	8.90
Erythromycin	1640	7.89
Tetracycline	1210	7.36
Nalidixic acid	2580	5.82
Amoxicillin	1190	5.72
Nitrofurantoin	700	4.18
Penicillin	810	3.90
Cotrimoxazole	700	3.37
Chloramphenicol	600	2.89
Ampiclox	500	2.41
Rifampicin	180	0.87

Table III: Resistant profile of *Staphylococcus aureus* to antibacterial agents

-	Percentage Resistance
4-quinolone	5.0
Gentamicin	46.0
Cephalosporins	64.0
Ampicillin	83.0
Nalidixic	84.0
Amoxicillin	89.0
Nitrofurantoin	89.0
Tetracycline	93.0
Penicillin	95.0

Discussion

The most frequently isolated bacterium from the four thousand two hundred and fifty patients was *Staphylococcus aureus* with 36.3 per cent. Akerele *et al* (5) reported that *Staphylococcus aureus* was the predominant pathogen from urine with 36.65 per cent in Benin City. About 31.6 per cent of patients had no pathogens isolated. The gross resistance of *Staphylococcus aureus* to Nalidixic acid (84%) and Nitrofurantoin (89%), the traditional drugs of choice for UTI gave a cause for concern. Other authors have attributed these resistant profiles to these antibacterial agents as a result of the followings: route of administration, frequency of dosing, patients' compliance and high number of substandard and cheap drugs. The 4-quinolones (Ciprofloxacin and Ofloxacin) had been the most effective of all the antibacterial agents against the Uropathogens with just 5.0 per cent resistance. The 4-quinolones are new class of antimicrobial agents, and were derived from precursor molecule called Nalidixic acid (8). The relatively high cost of the drug and low patronage has contributed to less abuse.

Abuja, a metropolitan city with a growing and teaming population, has had the health and social amenities over stretched. Therefore, there is the tendency for gross drug abuse hence this pattern of drug resistance. The health sector should have to put in place comprehensive antibiotic or drug policy, monitor drug distribution, usage and finally restricted dispensing. There is also the need to intensify the public enlightenment of drug usage and consequences associated with drug abuse.

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