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BRIEF REPORT

Antimicrobial resistance pattern in urinary tract infections in children on continuous ambulatory peritoneal dialysis

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ABSTRACT

Background: Growing antibiotic resistance demands the constant reassessment of antimicrobial efficacy, particularly in countries with wide antibiotic abuse. Knowledge of resistance trends is particularly important when prescribing antibiotics empirically, as is usually the case for urinary tract infections (UTIs) especially in children with terminal renal failure on continuous ambulatory peritoneal dialysis (CAPD) treatment. The aim of this study was to analyze the resistance of bacterial isolates to commonly used antibiotics in such patients.

Patients and methods: In this study, bacterial isolates were evaluated from urine samples collected from pediatric patients (6 months to 17 years) on CAPD with acute UTIs in Tehran from March 2006 through September 2006**.** Sensitivity was measured by disc diffusion method using NCCLS protocol.

Results: The most prevalent urinary pathogen was *Escherichia coli* from 27 cases (75%). In general, the lowest resistance rate of microorganisms was against amikacin (3.7%) and the highest resistance rate was against amoxicillin (70.4%).

Conclusion: A comparison of these data with those of other countries showed that there was considerable geographic variation in bacterial patterns of sensitivity and resistance properties. Therefore, the selection of antibiotics for empiric therapy especially in children with terminal renal failure on continuous ambulatory peritoneal dialysis (CAPD) treatment should be based on the knowledge of the local conditions.

Keywords: *Urinary tract infection, Continuous ambulatory peritoneal dialysis, Antibiogram.*
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INTRODUCTION

Urinary tract infections (UTIs) are the most common serious bacterial infections in childhood (1). The reported incidence of UTI is 3-5% in girls and 1% in boys (2) and in a large national study, UTI accounted for 40% of nosocomial infections (3). They occur in all age groups and are caused by a wide variety of pathogens with antimicrobial susceptibility patterns that have changed over time (4). UTI has great clinical significance due to its high acute mortality rate (20% in infants at the beginning of 21st century), malignant and chronic hypertension, and the chronic renal failure that follows chronic pyelonephritis (reflux nephropathy accounts for 7-30% of endstage renal failure in different countries) (5).

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UTIs in children on dialysis treatment are regarded as indirect contraindication for kidney transplantation. It is recommended for treatment of UTI to prescribe antibacterial agents in proper dosage (often in reduced amount) and to choose desired drugs in selected period of chronic renal failure (CRF) (6).

The aim of the study was to determine the local sensitivity pattern of microorganisms responsible for UTI in children on continuous ambulatory peritoneal dialysis (CAPD) in our center.

PATIENTS and METHODS

This descriptive study was conducted between March 2006 and September 2006 in Labbafinejad and Mofid Children Hospitals in Tehran, Iran. A total of 34 positive urine cultures of children with end stage renal failure on PD between 6 months to 17 years (outpatients and inpatients) who had signs and symptoms of UTI (such as jaundice, poor feeding, irritability, and weight loss in neonates and infants or dysuria, frequency, urgency and gastrointestinal symptoms in children) were studied. Positive urine culture was defined as more than 10^5 colony forming units (CFU) /ml of urine or more than 10^4 CFU of a single organism with pyuria or symptoms of UTI (7).

Cultures were performed from urine samples obtained by sterile urine bags in infants after disinfecting the perineum, and midstream urine samples in toilet-trained children.

The frequency of responsible microorganisms was recorded and sensitivity and resistance patterns of these microorganisms were assessed with disc diffusion method using NCCLS protocol (7).

RESULTS

Among 50 patients, 36 (72%) were females and 14(28%) were males. Twenty six pathogens (52%) were isolated from girls and 8 (16%) from boys and the majority of UTIs were in 13-17 years age group (table 1).

Table 1. UTI distribution by age in children on CAPD*

	Negative culture	Positive culture
6m-5y	14%(7)	8%(4)
6-12y	14%(7)	22%(11)
13-17y	4%(2)	38%(19)

* P=006

The microorganisms isolated from urine cultures were E. coli in 27 (75%), Enterococcous in 3 (8.3%), Staphylococcus epidermidis in 3 (8.3%), Kingella spp. in 1 (2.8%), and Candida albicans in 2 (5.6%) patients.

Gram negative organisms showed the highest sensitivity to amikacin (85.8%) and the highest resistance to amoxicillin and cefazolin (71.4% and 53.6%, respectively) (figure 1).

E.coli, the most common germ producing UTI, had a sensitivity rate of 88.9% to amikacin, 63% to ceftriaxone, and 66.7% to ceftizoxime. In the present study, the highest resistance rate of this bacterium was to amoxicillin (70.4%) and cotrimoxazole (55.6%) ($P < 0.05$) (figure 2).

Gram positive organisms were 100% resistant to cefixime, followed by co-trimoxazole (83.3%), and cefazolin (83.3%). It showed the highest sensitivity to vancomycin (50%) and amikacin (50%) (figure 3).

DISCUSSION

Similar to other reports, our study showed the predominance of E. coli as the etiology of UTI in children (1, 6). This study also revealed a very high microbial resistance rate to amoxicillin (70.4%) and cotrimoxazole (55.6%). A study in Iran during the past year revealed that E. coli had a resistance rate of 95.2% to penicillin, 79% to amoxicillin and 74.2% to cotrimoxazole (5). In a study conducted in Poland (6) E. coli strains showed sensitivity to second generation of quinolones (ciprofloxacin), third generation of cephalosporins (ceftazidime), and partial sensitivity to amoxicillin with clavulanic acid and aminoglycosides.

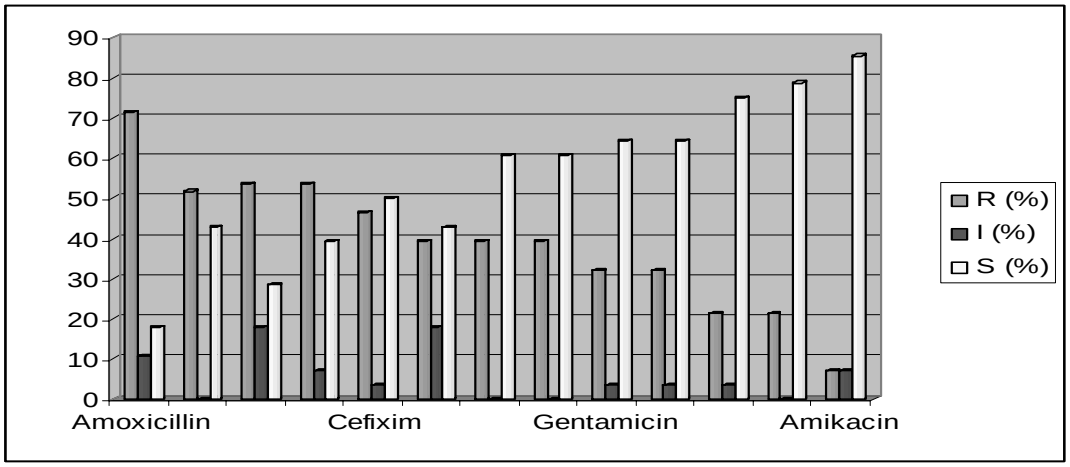

Figure 1. Sensitivity and resistance pattern of bacteria causing UTI in children on CAPD to antibiotics (R: resistant, S: sensitive)

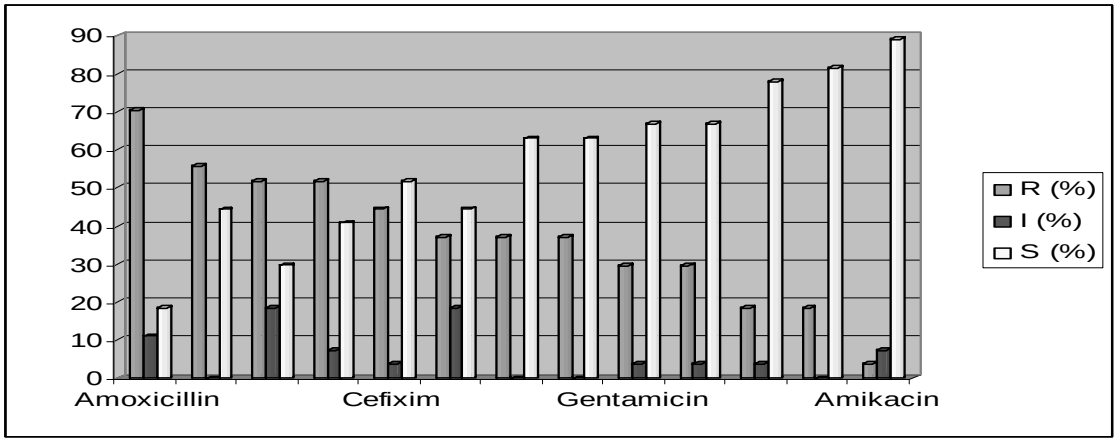

Figure 2. E. coli sensitivity and resistance pattern to antibiotics (R: resistant, S: sensitive)

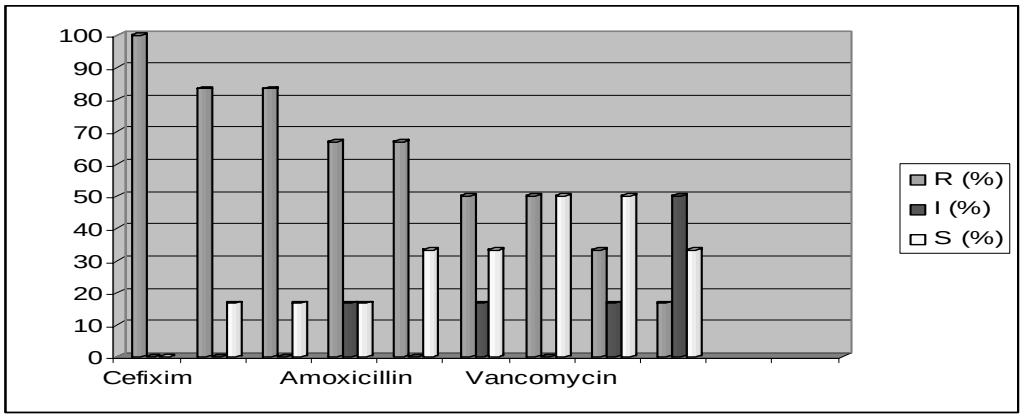

Figure 3. Gram positive microorganism sensitivity and resistance pattern to antibiotics (R: resistant, S: sensitive)

Another study performed in 252 health centers from 16 European countries and Canada, found that among 2478 E. coli isolates, 30% were resistant to ampicillin, 14% to co-trimoxazole, and 2% to ciprofloxacin. Studies in the United States showed that the resistance prevalence were roughly the same (8-10). In a Jordanian survey from the last 2 decades (1978-1999), uropathogenic E. coli isolates were highly resistant to ampicillin (82%-95%), tetracycline (83%-86%) and co-trimoxazole (48%–77%).

Recent studies published in Europe and North America during the past 6 years have demonstrated an increasing antibiotic resistance among uropathogenic E. coli isolated from either community or hospitalized patients. In particular, increased resistance up to 37% to various penicillins, cephalosporins and co-trimoxazole have been reported in uropathogenic E. coli in certain countries (16-21).

These differences might be attributed to a number of reasons as follows: 1- our study population is different from other studies; 2- antibiotic consumption in this group of patients is higher due to different infections (access devices are the major risk factors for infection); 3- self-prescribed treatments often are consumed shorter than the clinically-accepted time length, and this may be the cause of resistant organisms selection; and 4- abundance of generic drugs without adequate quality control may result in suboptimal plasma and/or tissue concentrations.

It can be concluded that organisms isolated from children with underlying renal problems are significantly more resistant to most tested antibiotics. This should be taken into account when selecting empiric treatment for UTI in children with underlying renal problems.

Further studies employing the minimum inhibitory concentration (MIC) method will be necessary to obtain more reliable results.

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