

Laboratory Evaluation of Urine Culture and Drug Resistance in Children Clinically Suspected of Urinary Tract Infection (UTI)

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Key Words: UTI, children, bacteriuria, drug resistance

ABSTRACT

Urine specimens from 6656 children clinically suspected of urinary tract infection were evaluated bacteriologically. Bacterial colony count of over (103) colony forming units CFU/ ml were found in 480 (7.2%) of total cases, with 342 (71.25%) girls and 138 (28.75%) boys. Bacterial etiology of positive culture were determined. *Escherichia coli* was the most frequent etiologic agent (75.62%) followed by *klebsiella* species (7.32%). The antimicrobial resistance behaviour of *Escherichia coli* to routinely used antibiotics were tested. Most strains of *Escherichia coli* were resistant to cotrimoxazole (82%) and ampicillin (82%), but none of them were resistant to ceftizoxime. Correlation between positive urine culture and pyuria for the diagnosis of UTI was compared. It was noted that approximately 38% of patients with positive urine culture did not have pyuria.

INTRODUCTION

Urinary tract infection is a common bacterial illness in children (3, 4). It is widely accepted that urinary tract infection disposes children and infants to an increased risk of later hypertension and chronic renal failure (12). Early diagnosis and treatment are thus considered key factors to reduce these risks (13).

Children with UTI usually have nonspecific symptoms, and the diagnosis of UTI on clinical symptoms are not reliable indicators of infection (9, 11). Several urine screening tests have been investigated in the past. Tests such as microscopy for the detection of urinary white cells (pyuria), reagent strips for leucocyte esterase and nitrite have been developed and used (5, 7, 10). Nevertheless there is continued debate on which test or combination of tests defines best the risk of UTI in children. The most accurate method for the diagnosis of UTI is urine culture. Children with UTI usually were treated empirically with antibiotics. It is necessary to assess the distribution and susceptibility of the micro-organisms in each case for the proper treatment.

The present study was conducted to assess the laboratory performance of urine culture in diagnosis of children suspected to have UTI, correlation between positive urine culture and pyuria, and evaluation of routinely used antibiotics in treatment of the most causative organism of UTI.

MATERIALS AND METHODS

During the period between July 2000 and July 2001, urine specimens of 6656 pediatric clinically suspected of UTI who were admitted to the Qoda pediatric hospital in Qazvin were examined for bacteriological culture. Patients aged between 3 months and 12 years old, but mostly were under 7 years old. The urine samples were taken by a clean-catch midstream, after washing the genitals with sterile water. Some specimens were obtained by suprapubic aspiration by physicians.

Each sample was inoculated with a 0.01 ml platinum loop onto blood agar and MacConkey agar plates. The plates were incubated at 35°C for 18 to 48 hours. Positive culture was defined if bacterial colony counts were more than (103) colony

forming units CFU/ ml. All bacteria were identified by using standard methods. Antibiotic susceptibilities were determined by disc diffusion method on Mueller Hinton agar.

The centrifuged urine sediments used for the detection of pyuria was recorded if the number of leukocytes were than four per high power field (phf).

RESULTS

Of the 6656 urine specimens cultured, 480 (7.2%) had a positive urine culture, with 343 girls and 138 boys (Table 1). The frequency of bacterial pathogens are shown in Table 2. As it shown in Table 2, *Escherichia coli* was the most frequent bacterium isolated from 363 patients, followed by *Klebsiella spp* (43), *Proteus spp* (32), *Enterobacter spp* (20), *Pseudomonas spp* (13), *Staphylococcus spp* (5), and *Citrobacter spp* (4).

The test results of antimicrobial susceptibility of *Escherichia coli*, against nine different antibiotics are shown in Table 3. Of 363 isolates of *Escherichia coli* tested, ceftizoxime inhibited (100%) of strains, nalidixic acid (97%), ciprofloxacin (95%), nitrofurantoin (95%), amikacin (93%), gentamicin (87%), cephalothin (40%), cotrimoxazole (18%), and ampicillin (18%). Correlation between positive urine culture and pyuria was compared (Table 4). As the results indicated approximately 38% of specimens with positive culture did not have pyuria.

Table 1. Sex distribution of children with urinary infection

Sex	Number	Percentage
Girls	342	71.25
Boys	138	28.75
Total	480	100

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Table 2. Frequency of bacterial pathogens isolated from positive cultures (No: 480)

Organisms	Frequency	
	No.of patients	Percentage
<i>Escherichia Coli</i>	363	75.62
<i>Klebseiella spp</i>	43	8.95
<i>Proteus spp</i>	32	6.66
<i>Enterobacter spp</i>	20	9.16
<i>Pseudomonas spp</i>	13	2.7
<i>Staphylococci spp</i>	5	10.4
<i>Citrobacter spp</i>	4	0.83

DISCUSSION

In our study only 7.2% of pediatric suspected of urinary tract infection, had a positive urine culture. Therefore, the definitive diagnosis of UTI urine culture was required, and diagnosis on clinical symptoms were not reliable indicator of infection.

Echerichia coli causes between 80 to 95% primary UTI and recurrent episodes in children (1, 11, 14). The results of this study are in agreement with previous findings. *Echerichia coli* was the most causative organism responsible for 75.62% of urinary tract infections. In most patients suspected laboratory results become available. The knowledge of etiology and drug resistance pattern is useful for empiric therapy. The results of this study showed that antibiotic with least effectiveness on *Echerichia coli* were cotrimoxazole and ampicillin.

In view of changing pattern of bacterial resistance to common drugs, the importance of educating physicians to use these antibiotics for empiric therapy is important.

Urine microscopy for evaluation of white cells (pyuria) have been assessed as predictors of UTI (2, 6). The results of this study showed that approximately 38% of children with positive urine culture did not have pyuria in their centrifuged urine sediments. Therefore, it can be concluded that pyuria as a single screening test does not provide sufficient level of sensitivity in diagnosis of UTI in children.

Table 3. Drug Susceptibility of *Escherichia coli* isolated from pediatric bacteriuria specimens (N:363)

Antibiotic	Susceptibility percentage
Ceftizoxime	100
Nalidixic acid	97
Ciprofloxacin	95
Nitrofurantion	95
Amikacian	93
Gentamicin	87
Cephalotin	40
Cotrimoxazole	18
Ampicillin	18

Table 4. Comparison between positive urine culture and pyuria

No. of positive culture	No. of WBC (hpf)	Percentage
480	Many	26.1
	18 – 20	5.38
	10-15	6.49
	6-10	13.07
	4-6	15.77
	1-3	23.68
	0-1	14.68

hpf = high power field

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