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ORIGINAL ARTICLE

PREDOMINANT ISOLATES OF UROPATHOGENS AND THEIR ANTIMICROBIAL SENSITIVITY IN FEBRILE CHILDREN ADMITTED TO EMERGENCY UNIT, TIKUR ANBESSA HOSPITAL

Muluwork Tefera, MD[1], Damte Shimelis, MD[1*], Solomon Tessema, MD[2]

ABSTRACT

Introduction: *Diagnosis of urinary tract infection in children requires a high index of suspicion and optimal specimen collection method and processing for culture. This study was conducted to identify the common urinary tract pathogens and their susceptibility pattern in children at a teaching Hospital in Addis Ababa, Ethiopia. The Objective of this study was to identify the predominant urinary pathogens and their antimicrobial susceptibility pattern in children admitted with fever and no other source of infection*

Methods*- This cross sectional study was conducted from April 2015-July 2016 in children between 0-15 years of age who were admitted to the emergency unit of the Department of Pediatrics with fever and no other source of infection. Antimicrobial sensitivity was determined according to laboratory standards.*

Results: *A total of 237 children were admitted with fever and no other source of infection. There were 46 urine culture positives of single organisms (19.4%). The most common organisms isolated were Eschericha.coli in 50% and Klebsiella species in 37%. Escherichia coli was resistant to gentamycin in 60.9%; ceftriaxone 79.6%, and ampicillin 95.7%. Klebsiella was 100% resistant to ampicillin, cotrimoxazole and augmentin.*

Conclusion: *A high rate of urinary tract infection and resistance compels area specific surveillance to select the appropriate antibiotic for empirical treatment of urinary tract infection in children.*

Key words*: Pediatrics, emergency unit, urinary tract infection, young infant*

INTRODUCTION

Urinary tract infection (UTI) is among the most commonly diagnosed bacterial infections of childhood, with an 11-year cumulative incidence of 1% in boys and 3% in girls (1). In girls, UTI peaks during infancy and toilet training. After the first UTI, 10-20% of all girls will develop a second UTI within 18 months (2). In boys, most UTI occur during the first year of life and are much more common in uncircumcised boys. During the first year of life there is male preponderance but beyond 1-2 year there is a striking female preponderance, with male: female ratio of 1:10 (2-5).

UTI may occur at any place along the genitourinary tract: urethra, bladder, ureters, renal pelvis or renal parenchyma; it may result in permanent renal damage and scarring (6).

Most UTIs are caused by colonic bacteria that gain entrance by ascending through the urethra. Many different microorganisms can infect the urinary tract but by far the commonest belong to the coliform group of Gram negative bacteria. The relative frequency of urinary pathogens varies depending upon age, catheterization, hospitalization and sex. In females 75-90% of all infections are caused by *E. coli*, followed by *Klebsiella* and *Proteus* (3, 7-10).

Most of the studies on UTI in our country are in adults (11-14). We, therefore, investigated the uropathogens and their antimicrobial sensitivity pattern in children who had fever, but no other source of infection.

Resistance among uropathogens to a variety of antibiotics is increasing and is becoming a serious problem in many developing countries (15). Several studies have shown increasing rates of resistance to commonly used antimicrobial agents in pediatric patients (5, 16-19)

[1] Department of Pediatrics and Child Health, Addis Ababa University [2] Health Promotion and Disease Prevention General Directorate, FMOH *Corresponding author: damte_shimelis@yahoo.com

PATIENTS AND METHODS

This was a cross sectional study conducted in the pediatric emergency unit over a 14-month period. All children between the ages of 0-15 years who were admitted with rectal temperature of > 39^0C, but no other source of infection were included in the study. A questionnaire on demographic data like age, sex, address and previous antibiotics used, were completed by a trained nurse at admission. Urinalysis and catheterized urine culture was done for infants and children who were not co-operative to give mid-stream sample. The trained nurse monitored all admitted children's charts daily for patient eligibility, urine culture and analysis and questionnaire completion. The sample size was 246 patients, which was calculated using estimation for a single population proportion taking 95% CI and precision of 5% and Power as 80%.

Eligibility and Exclusion Criteria for Study*:* All children between 0-15 years of age with fever and no other source of infection were included.Age beyond 15 years, known cause for the fever, urologic abnormality, recurrent UTI, who had antibiotic use in the past 15 days and who were not willing to participate were excluded.

Culture Technique and Definitions: Urine cultures were done by clean catch (mid stream urine) after cleaning the introitus in co-operative children and urethral catheterization in small children and in those who do not co-operate using standard aseptic technique. About 10 ml of freshly voided urine was then sent to the microbiology laboratory in sterile containers. Urine was refrigerated, if not plated, within 10 minutes of receipt. Standard quantitative culture was performed by laboratory technologists. A loop calibrated to deliver approximately 0.001 mL was used to inoculate blood and Mac Conkey agar plates. All plates were incubated at 35°C and examined daily for growth for 2 days. A positive result was defined as growth of a single urinary tract pathogen at $\geq 10^4$ CFU/mL in catheterized sample and $\geq 10^5$ CFU/ml in clean catch urine (20).

Statistical Analysis*:* Data was analyzed using SPSS version 20.1 and the differences between variables were assessed. The P values were determined using χ^2 tests. All p values were two tailed & P values less than .05 were used to determine statistical significant difference.

The study was reviewed and approved by the Department Research and Publication Committee and finally by the Institutional Review Board of the College of Health Sciences.

RESULTS

Over the study period, 237 children were admitted with fever, but no other source of infection. Children less than 5 years were 124 (52.3%) and 113 (47.7%) were 6-15 years. Males were 127 (53.6%) and 90.6% of them were circumcised. Table 1 shows age, gender and circumcision status of children with respect to urine culture positivity.

Table 1: Age, gender and circumcision status with respect to urine culture positivity in children admitted with fever and no other source of infection

Age (year)	Urine culture Positive N=46 (%)	Urine culture Negative N= 191(%)	Total 237 (%)	Pvalue
0-1	18 (28.6%)	45 (71.4%)	63 (26.6%)	0.015
1-5	12 (19.7%)	49 (80.3%)	61 (44.5%)	
5-10	12 (14%)	74 (86.0)	86 (36.3)	
>10	4 (14.8%)	23 (85.2%)	27 (11.4%)	
Gender				
Male	23 (18.1%)	104 (81.9%)	127 (53.6%)	0.468
Female	23 (20.9%)	87 (79.1%)	110 (46.4%)	
Male circumcision				
Yes	22 (19.1%)	93 (80.9%)	115 (90.6%)	.970
No	1 (8.3%)	11 (91.7%)	12 (9.4%)	

There were 46 culture positives of single organism (19.4%) but five with mixed flora were considered as contaminants. Among these culture positives 23 (50%) were females making a female to male ratio of 1:1. Out of 63 children who were below one year of age 18 (28.6%) and from 61 children between 1-5 years of age 12 children (19.7%) had confirmed UTI. The difference is statistically significant (P=0.015). The most common organisms isolated were *E.coli* in 23/46 (50%) of the children and *Klebsiella* species 17/46 (37%).

Table 2 shows the type of bacteria isolated. *E.coli* was isolated in 14 females (30.4%) and 9 males (19.6%) but the difference between females and males was not statistically significant (P =0.465).

Table 3 shows the antimicrobial susceptibility pattern of the two most common organisms isolated. *E.coli* was resistant to gentamycin in 60.9%; ceftriaxone 79.6%, ampicillin 95.7%. *Klebsiella* was 100% resistant to ampicillin, cotrimoxazole and augmentin.

Table 2: Pathogenic bacteria isolated from urine in children who were admitted with fever and no other source of infection

	Gender			
Bacterial isolates	Male	Female	Total	P –value
E.coli	9 (19.6)	14 (30.4)	23 (50)	0.468
K.pneumonie	10 (21.7)	7 (15.2)	17 (37)	
Enterobacter species	1 (2.2)	0	1 (2.2)	
Citrobacter species	2 (4.3)	2 (4.3)	4 (8.6)	
Providencia rettgeri	1 (2.2)	0	1 (2.2)	
Total	23 (50)	23 (50)	46 (100)	

Table 3: Drug susceptibility pattern of the two most commonly isolated pathogens from urine in children admitted with fever and no other source of infection

Drugs	*E.coli* (n=23)		*Klebsiella* species (n=17)	
	Sensitive	Resistant	Sensitive	Resistant
Gentamycin	9 (39.1)	14 (60.9)	4 (23.5)	13 (76.5)
Ceftriaxone	7 (30.4)	16 (69.6)	5 (29.4)	12 (70.6)
Ampicillin	1 (4.3)	22 (95.7)	0	17 (100)
Cotrimoxazole	3 (13)	20 (87.0)	0	17 (100)
Augmentin	0	23 (100)	0	17 (100)
Ciprofloxacin	8 (7.7)	15 (92.3)	3 (17.6)	14 (82.4)
Chloramphenicol	5 (20.4)	18 (79.6)	5 (29.4)	12 (70.6)

DISCUSSION

Urinary tract infection is one of the common clinical problems in pediatric practice. It could be a marker of underlying urinary tract abnormality in infants and young children (21). Early diagnosis would prevent serious life threatening complications. The overall prevalence of UTI varies with, age, gender, race and circumcision status. (22). The prevalence of UTI in our children was 19.4% and is similar to a local study done at Yekatit 12 Hospital, Addis Ababa, Ethiopia (un-published thesis report) which was done in 384 children between the ages of 0-15 years was 15.9%. A similar study done in India showed a prevalence rate of 16.6% in children between the ages of 1-10 years (23), but a study done in Pakistan showed a prevalence rate of 37.5% (24). A 2008 systematic review approximates a cumulative prevalence of 7.0% in children between two months to 24 months and 8% from two years to 19. This is lower than our finding (22). A study done in 2015 in Taiwan in young children aged day 1 to 36 months showed a prevalence rate of 11.3% (2). The prevalence of UTI in infants less than 1 year of age in our study was 19/63 children (30%) and this is statistically significant (P= 0.015) when compared with the other age groups above one year of age.

There was no statistically significant gender difference (P= 0.468) in the occurrence of UTI in our study as the male circumcision rate in our study subjects was very high. The Taiwan study showed that in febrile patients < 1 year of age boys had a significant higher prevalence (14%) than girls (10.6%) due to a high proportion of uncircumcised boys (24).

The microorganisms isolated in this study were *E.coli* in 23 patients (50%), *K.pneumoniae* in 17 patients (37%) and *Citrobacter* species 4 patients (8.6%). The Taiwan study and many other studies have shown that these two organisms are the commonest offenders of the urinary tract (3-5, 7-10, 24). There was no statistically significant gender difference in the prevalence of these two organisms. The present study showed that the resistance rate of E.coli was 100%, 95.7%, 92.3%, 87.0% to Augmentin, Ampicillin, Ciprofloxacin and cotrimoxazole respectively.

The resistance rate of *K.pneumoniae* was 100% to ampicillin, cotrimoxazole, and augmentin, 82.4%, 76.5% to ciprofloxacin and gentamycin respectively. The resistance rates of these organisms is alarming in developed as well as developing countries (5,16,17-19); the extensive use of these antibiotics explains the high selection pressure for resistant organisms. The increasing rate of resistance of these two organisms to augmentin, ampicillin, cotrimoxazole and ciprofloxacin limits their use in empirical treatment of UTI in children.

Conclusion*:* the occurrence of high rate of urinary tract infection and antimicrobial resistance of urinary pathogens compels local, population specific surveillance to choose the appropriate antibiotic for empirical therapy. We recommend that the antibiotic of choice for empiric therapy should be guided by prevalence of bacterial organisms and their susceptibility patterns rather than textbook guidelines. It is recommended that surveillance for UTI in children including susceptibility patterns be designed and instituted because common etiologic agents are resistant to the drugs that we currently use in empiric treatment.

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