

## Bacterial Susceptibility to Antibiotics in Urinary Tract Infections in Children, KSAFH, Saudi Arabia, Tabuk

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### ABSTRACT

**Objective:** this study aimed to determine the distribution and antibiotic susceptibility patterns of bacterial strains isolated from patients with community-acquired urinary tract infections (UTIs) at King Salman Armed Forces Hospital, Saudi Arabia, Tabuk. Urinary tract infections (UTIs) remain the common infections diagnosed in outpatients as well as hospitalized patients. Early diagnosis and comprehensive treatment can significantly decrease late serious complications. Current knowledge on antimicrobial susceptibility pattern is essential for appropriate therapy. **Methods:** urinary isolates from symptomatic UTI cases attending to King Salman Armed Forces Hospital were identified by conventional methods. Positive urine cultures from 210 patients aged less than 14 years were studied. Antimicrobial susceptibility testing was performed by Kirby Bauer's disc diffusion method. Results were analyzed by using the NCCLS guidelines of the 210 samples that showed growth of pathogens. **Results:** the most prevalent were *E. coli* (96.7%) followed by *Klebsiella* spp (3.3%). The majority (81%) of the isolates were from females, while the remaining was from males. Among these gram-negative enteric bacilli very high prevalence of resistance was observed against Ampicillin and Co-trimoxazole. For *E.coli* the lowest resistant rate was that for Nitrofurantoin 10.3% followed by Norfloxacin and Ceftriaxone (11.3% and 11.8% respectively). Resistance to Gentamicin and Nalidixic acid was observed in 19.2% and 47.3% respectively. For *Klebsiella*, all organisms were sensitive to Gentamicin and Norfloxacin and all organisms were resistant to Ampicillin. There was a high resistance rate to Ceftriaxone (42.9%). **Conclusion:** this study revealed that *E. coli* was the predominant bacterial pathogen of community-acquired UTIs at King Salman Armed Forces Hospital. Most of the organisms were resistant to Ampicillin and Co-trimoxazole; it also demonstrated an increased resistance to Nalidixic acid and Gentamicin. This study is useful for the clinician in order to improve the empiric treatment.

**Key words:** pediatrics, antibiotics, infection, UTI, susceptibility, *Ecoli*, resistance

### Introduction

Pediatric urinary tract infections (UTI) account for 0.7% of physician office visits and 5–14% of emergency department visits by children annually<sup>[1]</sup>. In developed countries, urinary tract infection (UTI) in children is second only in frequency to upper respiratory tract infections as a cause of morbidity<sup>[2]</sup>. Most UTIs in children result from ascending infections, although hematogenous spread may be more common in the first 12 weeks of life. Most UTIs in children are monomicrobial<sup>[3]</sup>. UTI is caused mainly by colonic bacteria. In females 75-90% of infections were caused by *Escherichia coli* (*E.coli*) followed by *Klebsiella* and *Proteus*. In males, some series report that *Proteus* is as common as *E. coli*, while others report a preponderance of gram-positive organisms. *Staphylococcus saprophyticus* is a proven pathogen in both sexes<sup>[4]</sup>. Approximately 13-15% of end-stage renal diseases were thought

to be related to unrecognized UTI in childhood<sup>[5]</sup>. Though UTI is a common problem throughout the world the microbial isolates and their sensitivity pattern needs to be analyzed at intervals to monitor the changing patterns of microbial flora and the development of resistance to drugs which may help physicians to treat UTI in a better way and to prevent further complications<sup>[6]</sup>.

### Material and methods

Urinary isolates from symptomatic UTI cases attending pediatric OPC and those admitted in the pediatric ward of King Salman Armed Forces Hospital were identified by conventional methods (supra-pubic bladder aspiration in infants and clean catch midstream urine in older children).

The study period was for one year from June 2017 to June 2018. Children of both sexes under the age of 14 years were included in the

study. 600 children with fever and/or acute voiding symptoms (Dysuria, burning micturition, increased frequency, and abdominal pain) were included. Neonates; children with VUR; PUV; GN; NS; recurrent UTI and children with a history of previous antibiotic usage were excluded. Cultures were considered positive when there was growth of a single pathogen of >10<sup>5</sup> colony forming units/ml in a urine specimen collected by midstream catch; of >10<sup>4</sup> colony forming units/ml in urine collected by bladder catheterization, and any growth in urine obtained by a suprapubic aspiration. Mixed pathogen growth results were considered unreliable and been excluded. Positive urine cultures from 210 patients were studied. Antimicrobial susceptibility testing was performed by Kirby Bauer's disc diffusion method. Results were analyzed using the NCCLS guidelines.

**Results**

In our study from 600 patients (280 males and 320 females) were included. We found only 210 positive cultures. Females were more affected. 170 (81% ) of the isolates were from females while ,40 (19% ) were from males (**Table1** ).

**Table 1: males to females ratio in the positive cultures**

Gender	Total number	Positive culture
Male	280 (46.7% )	40 ( 19 % )
Female	320 ( 53.3 % )	170 ( 81 % )

Of the 210 samples that showed growth of pathogens the most prevalent were *E. coli* (96.7%) followed by *Klebsiella* spp (3.3%) (**Table 2**).

**Table 2: growth of pathogens ( *E. coli* and *Klebsiella* )**

Isolated pathogen :	Number of positive cultures	%
<i>E. coli</i>	203	96.7
<i>Klebsiella</i>	7	3.3

Among these gram-negative enteric bacilli very high prevalence of resistance was observed against Ampicillin and Co-trimoxazole. For *E.coli* the lowest resistant rate was that for Nitrofurantoin 10.3% followed by Norfloxacin

and Ceftriaxone (11.3% and 11.8% respectively). Resistance to Gentamicin and Nalidixic acid was observed in 19.2% and 47.3% respectively. For *Klebsiella*, all organisms were sensitive to Gentamicin and Norfloxacin and all organisms were resistant to Ampicillin. There was a high resistance rate to Ceftriaxone (42.9%) (**Table3**).

**Table 3: prevalence of resistance of pathogens against antibiotics**

Tested antibiotic :	<i>E. coli</i> ( 203 positive cultures )	<i>Klebsiella</i> (7 positive cultures )
Ampicillin	R = 177 ( 87.2 % )	R = 7 (100% )
Co-trimoxazole	R = 166 ( 81.8 % )	R = 4 ( 57 % )
Nitrofurantoin	R = 21 ( 10.3 % )	R = 4 ( 57 % )
Norfloxacin	R = 23 ( 11.3 % )	R = 0 ( 0 % )
Ceftriaxone	R = 24 ( 11.8 % )	R = 3 ( 42.9 % )
Gentamicin	R= 39 ( 19.2 % )	R = 0 ( 0 % )
Nalidixic acid	R = 96 ( 47.3 % )	R = 1 (14.2 % )

**Discussion**

Frequently cultured organisms isolated in UTIs belong to the family of gram-negative, facultative anaerobic bacilli Enterobacteriaceae [7]. 90% of all community-acquired urinary tract infections and more than 30% of nosocomially acquired UTIs were caused by *E. coli* [8,9]. In our study, we faced only tow pathogens *E.coli* causing 96.7% of all cases and *Klebsiella* causing 3.3% of all studied positive cultures. When suspicion of UTI is weak treatment can be deferred until the final results of culture. Empiric antibiotic treatment for UTI is based on the knowledge of the predominant pathogens and their antimicrobial susceptibility in the area of practice [10,11]. The WHO guidelines indicated that TMP/SMX and ampicillin as the first choice for treatment of UTI [12]. In our practice we used ultrasporine and TMP/SMX orally and ceftriaxone iv as the first choice for empirical treatment of UTI. In our study, we found that among gram-negative enteric bacilli very high prevalence of resistance was observed against Ampicillin and Co-trimoxazole. For *E.coli* the lowest resistant rate was that for Nitrofurantoin 10.3% followed by Norfloxacin and Ceftriaxone (11.3% and

11.8% respectively). Resistance to Gentamicin and Nalidixic acid was observed in 19.2% and 47.3% respectively. For *Klebsiella*, all organisms were sensitive to Gentamicin and Norfloxacin and all organisms were resistant to Ampicillin. There was a high resistance rate to Ceftriaxone (42.9%).

### Conclusion

This study revealed that *E. coli* was the predominant bacterial pathogen of community-acquired UTIs at King Salman Armed Forces Hospital. Most of the organisms were resistant to Ampicillin and Co-trimoxazole; it also demonstrated an increased resistance to Nalidixic acid and Gentamicin. This study is useful for the clinician in order to improve the empiric treatment.

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