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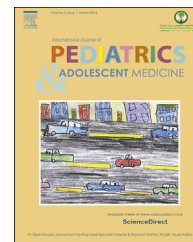


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ORIGINAL RESEARCH ARTICLE

Can urinary nitrites or other urinalysis findings be a predictor of bacterial resistance of uncomplicated urinary tract infections?



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Abstract *Background and objectives:* To evaluate whether initial urinalysis (UA) and urinary nitrite results can be used as a proxy for choosing empiric antibiotic therapy.

Materials and methods: A retrospective study was conducted in an urban inner city community hospital in New York City (NYU Woodhull Medical Center). We reviewed the charts of patients seen in the Emergency Department and Pediatric Clinic who had a diagnosis of urinary tract infection (UTI) during a 3 year time period (January 2010–December 2012). Statistical analysis was performed using SPSS 20.0 statistical software.

Results: Between January 2010 and December 2012, a total of 378 patients had a diagnosis of UTI. Seventy-five (19.8%) were males and 203 (80.2%) were females. Of the 378 patients with a diagnosis of UTI, the most common isolated pathogen was *Escherichia coli*, which was detected in 283 (74.9%) isolates. Other bacteria included *Klebsiella* spp 30 (7.9%), *Proteus* 21 (5.6%), *Enterococcus* 14 (3.7%), and others 30 (7.9%). The resistance rate was higher in the nitrite positive group for the following antibiotics: TMP/SMX and ampicillin with or without sulbactam. No significant correlation was found with the remaining studied antibiotics. No significant correlation was found between leukoesterase and the resistance patterns in all of the studied antibiotics, except cefazolin.

Conclusion: Urinary nitrite results are not helpful in choosing an initial antibiotic to treat a UTI. Leukocytosis in the blood or urine or the presence of a fever cannot be used to predict

Abbreviations: UTI, urinary tract infection; CBC, complete blood count; LE, leukocyte esterase; UA, urinalysis.

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bacterial resistance. The use of nitrofurantoin or cephalexin for the treatment of cystitis was optimum, and in the presence of negative leukoesterase, nitrofurantoin was preferable to cephalexin.

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1. Introduction

Urinary tract infections (UTIs) occur in 1–3% of girls and 1% of boys. In girls, the first UTI usually occurs by the age of 5 years, with peaks during infancy and toilet training. In boys, most UTIs occur during the 1st year of life. The prevalence of UTIs varies with age. During the 1st year of life, the male: female ratio is 2.8–5.4: 1. Beyond 1–2 years, there is a female preponderance, with a female: male ratio of 10: 1 [1].

The association between urinary nitrite and UTIs was first reported in 1914 and has frequently been the object of investigation [2]. The advantages of utilizing urinary nitrites are its low cost, the rapidity with which the results are available, and its ability to categorize patients into two distinct groups, nitrite positive or negative [3,4].

Knowledge of the spectrum of pathogens and their patterns of resistance in the population allows the clinician to empirically select an effective agent [5]. Whether the absence of urine nitrites predicts resistance to common antibiotics that are used for the treatment of uncomplicated UTIs has been poorly investigated. Furthermore, the results from the few studies that have investigated this correlation are conflicting [6–9].

2. Materials and methods

2.1. Setting

Woodhull Medical Health and Mental Center is an inner city community hospital in New York, NY that is affiliated with NYU, School of Medicine.

2.2. Study design

This is a retrospective, descriptive, and analytical study that was conducted in an urban inner city community hospital in New York City (NYU Woodhull Medical and Mental Health Center). Charts were reviewed for all patients seen in the Emergency Department and Pediatric Unit who had a diagnosis of a UTI during a 3-year period (Jan 2010–Dec 2012).

Urine cultures were sent either by urine catheterization or clean mid-stream catch depending on whether the patient was toilet trained or not. As a general practice in our institution, a culture obtained by a urinary bag is not sent due to the high likelihood of contamination. This study received approval from our Institutional Review Board of NYU Langone Medical Center before chart review commenced.

2.3. Data storage and statistical analysis

The chart numbers were obtained from the medical record department at Woodhull Medical and Mental Health Center. All of the charts were reviewed through the use of the electronic medical record system QUADRAMED to obtain demographic, clinical, and laboratory information from the patients.

The data were stored on NYU REDCap (secure data base on NYU Onsite) on a secured computer in Woodhull Medical Center. Each subject was entered into the REDcap database as a subject number (1, 2,3, etc.). We used SSPS statistical software, version 20, to analyze our data. Chi-square and Fisher Exact tests were used. *P* value < .05 was considered statistically significant.

3. Inclusion and exclusion criteria

We collected the records of all pediatric patients aged 1 day to 18 years of age who had a final discharge diagnosis of UTI, cystitis, or pyelonephritis. Only patients who had a single urine pathogen of $>10^5$ colony-forming units (CFU) per milliliter were included. Patients who had a diagnosis of UTI, pyelonephritis, or cystitis were excluded if no urine culture was sent, if the culture was negative, or grew more than a single pathogen.

4. Measurements

The following information was collected from the medical records: demographic information (age and sex), history of subjective or documented fever, urinalysis (UA) findings (urine white blood cell [WBC], leukocyte esterase [LE], and nitrite), leukocytosis in the complete blood count (CBC), causative organism, and susceptibility pattern to antibiotics. For the purpose of the study, leukocytosis was defined as a WBC in the complete blood count of more than 15,000 regardless of the subject's age. Positive WBCs in the urine was defined as the presence of >5 WBC/power field. Sensitivity information was gathered for each bacterium. A bacterium was considered to be resistant to a specific antibiotic if the report read either resistance or intermediate.

5. Results

We studied the sensitivity pattern to the following antibiotics: ampicillin, ampicillin/sulbactam, cefazolin, cefuroxime, cefotaxim, ceftazidim, cefepime, ciprofloxacin, nitrofurantoin, gentamicin, piperacillin/tazobactam, trimethoprim/sulfamethoxazole, and imipenem.

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