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Follow-up after infants younger than 2 months of age with urinary tract infection in Southern Israel: epidemiologic, microbiologic and disease recurrence characteristics



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ABSTRACT

Background: The timing of most recurrences after neonatal urinary tract infection is during the first year of life, with peak incidence 2–6 months after the initial infection. Information on the microbiologic characteristics of recurrent urinary tract infection episodes in relation to the microbiology of the initial episodes is limited.

Objectives: To analyze the epidemiologic/microbiological characteristics of 1st and recurrent urinary tract infection in infants <2 months of age.

Methods: A retrospective study including all infants <2 months of age with urinary tract infection admitted during 2005–2009 and followed till the age of 1 year.

Results: 151 neonates were enrolled (2.7% of all 5617 febrile infants <2 months of age admitted). The overall incidence of urinary tract infection occurring during the first 2 months of life was 151/73,480 (0.2%) live births during 2005–2009 in southern Israel (2.1 cases/1000 live births). One pathogen was isolated in 133 (88.1%); *Escherichia coli*, *Klebsiella* spp., *Enterococcus* spp., *Morganella morganii*, *Proteus* spp., and *Enterobacter* spp. represented the most common pathogens (57.9%, 12.2%, 7.9%, 6.7%, 6.1%, and 5%, respectively). Trimethoprim/sulfamethoxazole, ampicillin, and cefuroxime-axetil were the most commonly recommended prophylactic antibiotics (45%, 13.2%, and 8%, respectively). Twenty-three recurrent urinary tract infection episodes were recorded in 20 (13.2%) patients; 6/23 (26%) were diagnosed within one month following 1st episode. *E. coli* was the most frequent recurrent urinary tract infection pathogen (12/23, 52.2%). No differences were recorded

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in *E. coli* distribution between first urinary tract infection vs. recurrent urinary tract infection. Seventeen (74%) recurrent urinary tract infection episodes were caused by pathogens different (phenotypically) from those isolated in 1st episode. Recurrent urinary tract infection occurred in 25.0%, 8.3%, and 0 patients recommended trimethoprim/sulfamethoxazole, cefuroxime-axetil, or amoxicillin prophylaxis, respectively.

Conclusions: (1) The study determined the incidence of urinary tract infection in febrile infants <2 months of age in Southern Israel; (2) *E. coli* was responsible for the majority of first and recurrent urinary tract infection; (3) recurrent urinary tract infection was caused mostly by pathogens different than the pathogens isolated at initial episode.

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Introduction

The incidence of urinary tract infections (UTI) is 3–4.6% in neonates, 0.7–5.9% in infants up to 1 year of age, 1–3% at the age of 1–5 years and 0.71–2.3% at school age.^{1,2} Approximately 7–8% of girls and 2% of boys will develop an UTI during the first 8 years of life.³ The most common pathogen is *Escherichia coli*, causing up to 70–90% of all UTIs.^{4,5}

Diagnosis of UTI is of major importance, particularly in young ages, because the infection may represent, potentially, the first sign of a congenital defect of the urinary tract. Early diagnosis and treatment are considered to prevent complications such as renal scarring, deteriorating renal function, and hypertension, especially in young infants and children <5 years of age.⁶ The most common abnormality diagnosed by imaging investigation is vesico-urethral reflux (VUR).^{6–9} The rate of VUR in children <1 year of age is between 18–35%.^{6,8,9} It is known today that severe VUR may be associated with development of renal scars by up to 4–6 times more than a low grade VUR and 8–10 times more likely than in patients without VUR.^{6,8,9}

The timing of most UTI recurrences after neonatal UTI is during the first year of life, with peak incidence 2–6 months post infection.¹⁰ In general, UTI recurrence occurs in 30–40% of the children with UTI and around 60% of them will have the recurrence during the first two years of life. In a retrospective study completed between 1978 and 1984 and including 262 children <1 year of age followed for three years after the first episode, 35% boys and 32% girls developed recurrent UTI and the recurrent UTI incidence was higher in children with higher (III–V) degrees of reflux.¹¹

Information on the microbiologic characteristics of the recurrent UTI episodes in relation to the microbiology of the initial episodes is limited. The objectives of our study are to describe and characterize the 1st UTI episode in infants <2 months of age admitted at our center during 2005–2009, to determine the incidence of UTI in this population in Southern Israel, to establish the rates of recurrent UTI episodes until the age of 1 year and the microbiologic characteristics of these episodes, and to discuss the appropriate antibiotic treatment policies for the treatment and prophylaxis of UTI in infants.

Patients and methods

This was a retrospective study performed during 2005–2009 and including all the infants <2 months of age admitted to the pediatric departments of the Soroka University Medical Center with the diagnosis of UTI proven by urine culture (obtained by supra-pubic aspiration or bladder catheterization). Our hospital is the only primary and tertiary medical center in Southern Israel and takes care of a population of approximately 1 million patients, out of them around 250,000 children.³

Infants <2 months of age, following the hospitalization with UTI, were discharged with the recommendation for antibiotic prophylaxis and for imaging investigations of the urinary tract during the period of two months following the original UTI episode, according to the available recommendations.^{6,8} The medical records of the admitted infants, laboratory findings from the bacteriological laboratory and imaging data from the radiology department and the nuclear medicine institute, were searched. Age, sex and ethnicity of the infants with UTI were documented. All urine cultures were obtained (at the initial and also the recurrent UTI episode) by catheterization or suprapubic aspiration. The recovered urine cultures pathogens were considered true uropathogens according to treatment physicians and additional recommendations by the pediatric infectious disease unit of the hospital. *Pseudomonas aeruginosa*, *Staphylococcus aureus*, and *Candida albicans* were not considered true uropathogens in single pathogen or mixed pathogens-UTI cases without an additional renal anatomic abnormality.

A comparative analysis of the microbiological factors responsible for the first and for the recurrent UTI episodes was performed. The antibiotic coverage and duration of treatment of UTI were documented. The timing of the UTI recurrence was analyzed in relation to the initial UTI episode. Anatomical abnormalities diagnosed during the first episode of UTI were documented as well as all imaging finding completed during the follow-up period. When VUR diagnosis was present, its severity degree was reported.

The antibiotic prophylaxis policy was not well defined at the pediatric department during the study period, leaving at the physicians' decision the specific antibiotic to be administered. However, the local guidelines recommended antibiotic

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