

Original Article

Urinary Tract Infection in Infants and Children in Al-Jahra Area, Kuwait: An Overview

Samir I Saleh, Mohamed M Tuhmaz, Mansour Y Sarkhouh, Mohamed A El-Ghawabi
Department of Pediatrics, Al-Jahra Hospital, Kuwait

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ABSTRACT

Objective: To find the prevalence of urinary tract infections (UTI) in Al-Jahra area, Kuwait and to evaluate the clinical data and laboratory tests that help in the diagnosis of UTI in children.

Patients and Methods: One hundred and forty-eight patients with proven UTI were included in this study. They were subjected to detailed history and thorough clinical examination. Urine was collected for analysis and culture, and imaging studies necessary for evaluation of the urinary tract were done.

Results: Our patients commonly presented with fever and lower urinary symptoms. The majority had no physical

signs. Urinalysis was positive in almost all patients, and the organism most commonly isolated was *E. coli*. Ultrasound examination was useful in the identification of urinary tract anomalies and abnormalities of renal growth. Renal scars were found in 21% of patients.

Conclusion: UTI are common in infants and children in Al-Jahra area; 5.5% are affected. They usually present with fever and lower urinary tract symptoms. The disease has to be suspected in febrile patients even in the presence of an equivocal cause of the fever; urinalysis can help in such decision. Furthermore, it is important to treat patients promptly and effectively because of the potential sequelae.

KEYWORDS: bacteriuria, children, pyuria, renal imaging, urinalysis, urinary tract infection

INTRODUCTION

Unlike severe bacterial illness, little attention has been focused on identification of urinary tract infections (UTIs) in febrile children despite recent information that suggests both a high prevalence of UTIs and significant associated morbidity in this population^[1]. Approximately 13-15% of end-stage renal disease are thought to be related to unrecognized UTI in childhood^[2]. Individual differences in susceptibility to UTI may be due to host factors such as production of urethral and cervical IgA antibodies as well as other factors that influence bacterial adherence to the introitus and the urethral epithelium^[3,4]. Congenital anomalies of the urinary tract such as posterior urethral valve, vesico-ureteric reflux, ureteric duplex, etc., are also well known causes of UTI in children^[3].

The prevalence of UTI varies markedly with sex and age. Initial episodes of UTI occur more commonly in infancy^[5], the reported prevalence is between 4.1 and 7.5%^[6]. In school girls, symptomatic and asymptomatic UTIs occur in 1.2-1.9%^[7], while it is quite rare in school boys of similar age^[8]. The clinical manifestations vary. They often fail to indicate clearly whether the infection is confined to the bladder or involves the kidneys as well. In children 3-6% present with fever alone, while 4.1% of infants less than 2 years

of age present with upper respiratory or gastrointestinal symptoms^[9].

UTI are caused mainly by colonic bacteria. In females 75-90% of infections are 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^[10].

The rationale for carrying out this study is to determine the prevalence of UTI among children in Al-Jahra area and to evaluate clinical and laboratory tests that help in the evaluation of these patients.

PATIENTS AND METHODS

One hundred and forty-eight infants and children with UTI were included in this study. A child is considered to have UTI if a properly collected urine promptly plated, grows more than 100,000 colonies/ml of a single organism. Detailed history was obtained. Extra urinary manifestations such as irritability, poor feeding, anorexia or vomiting, together with lower urinary symptoms such as dysuria, frequency, dark urine and foul smell urine were looked for. All patients were examined clinically. Blood pressure was recorded and the circumcision status of the male patients was noted. A mid-stream urine sample was

Address correspondence to:

Dr. Samir I Saleh, Department of Pediatrics, Al-Jahra Hospital, P.O. Box: 40206, Safat, Kuwait. Tel: (965)4575300 Ext:5526 & 2822, Fax: (965)4582048. Pager: 9228073

Table 1

Children with recurrent UTI in Jahra Hospital; 1996 - 1999

	None	Once	2-3 Times	>3 Times	Total
Males	4	3		1	8
Females	41	52	18	29	140
Total	45	55	18	30	148

UTI = Urinary tract infection

Table 2

Summary of clinical findings of UTI cases

Clinical findings	Frequency	%
Symptoms		
Fever alone	30	20.3
Hematuria	6	4.1
Lower UT symptoms	14	9.5
Fever & lower UT symptom	90	60.8
Extra UT symptoms	8	5.4
Signs		
None	116	78.37
Edema	24	16
Suprapubic tenderness	4	2.7
Loin tenderness	1	0.7
Hypertension	3	2
Physical development		
Normal	136	91.6
Poor weight gain	9	6.1
Delayed physical growth	2	1.4

UT = Urinary tract

obtained from older children for culture and sensitivity. In small children and infants urine was collected in urine bag under strict aseptic technique. Laboratory evaluation was done before initiation of antibiotic therapy. It included urine examination, urine and blood cultures and renal function tests. Renal ultrasound was done in all patients. Dimercaptosuccinic acid (DMSA) scan was done in some patients on initial evaluation and repeated after 4-6 months in those with equivocal results. Micturating cystourethrogram (MCUG) was performed in female patients with recurrent UTI and in male patients on initial diagnosis. Intravenous pyelography (IVP) was done in patients whose abdominal ultrasound showed anatomical abnormalities of the urinary tract. Data were analyzed statistically by using the SPSS for windows, version 10.

RESULTS

Over a period of three years from March 1996 to March 1999, out of 2702 new patients who attended the pediatric OPD in Al-Jahra Hospital, and including those referred from casualty and inpatient wards, 148 (5.5%) infants and children had proven UTI and were included in this study. Their mean age was five years and nine months;

Table 3

Laboratory findings of UTI cases

Laboratory Tests/Findings	Frequency	%
Urinalysis		
Bacteriuria	27	18
Pyuria	14	9.3
Hematuria & proteinuria	7	4.7
Nitrites +ve	1	0.7
All	98	66.2
Nil	1	0.7
Urine culture		
>1 Organism	2	1.4
<i>E.coli</i>	130	87.8
<i>Proteus</i>	5	3.4
<i>Pseudomonas spp.</i>	2	1.4
<i>Staph. saprophyticus</i>	1	0.7
<i>Strept. faecalis</i>	1	0.7
Others	7	4.7
Others		
BUN > 10 mmol/L	27	18.2
Leucocytosis 15,000/ul	41	27.7
ESR 30 mm	43	29

Bacteriuria 100 cells/ml urine

Pyuria = WBC 10/hpf. Centrifuged urine

range one month to 13 years (Fig. 1). Eight (5.4%) were males and 140 (94.6%) were females. The mean age of the male patients was 2.5 years (range three months - eight years) and that of the females six years (range one month - 13 years). Four males were circumcised. Seven patients (4.7%) had a positive family history of UTI, and 103 (69.6%) had history of recurrent UTI (Table 1) defined by urine culture. Table 2 summarizes the clinical data.

Fourteen patients (9.3%) had urine WBC (10/hpf) 27 (18%) had bacteriuria, and seven (4.7%) had hematuria. Urine was only positive for nitrites in one patient (Table 3). One hundred and thirty patients (87.8%) had *E. coli*, five had *Proteus*, two had *Pseudomonas spp.*, one had *Staph. saprophyticus* and one had *Strept. faecalis* (Table 3) on urine culture.

Blood urea nitrogen was high > 10 mmol/L (normal = 1.8 - 6.4 mmol/L) in 27 patients (18.2%), peripheral leucocytosis; 15,000/ul (normal = 4.5 - 13.5 x 1000/ul) in 41 patients (27.7%) and ESR more than 30 mm in the first hour (normal = 0-10 mm/hr) in 43 (29%) patients (Table 3).

Renal ultrasound (Table 4) revealed urinary tract obstruction in nine patients (6.1%), and congenital anomalies in four (2.7%). Of the 69 patients who did DMSA scan, 12 had scars on initial diagnosis and three developed them four to six months later on re-evaluation. Varying grades of vesicoureteral reflux (VUR) were detected in 23 patients out of the 53 patients who did MCUG; 14 with grade I (international grading system), four with grade II, three with grade III and two with grade IV reflux (Table 4).

Table 4

Findings of imaging studies in UTI in children

Imaging Technique/Finding	Frequency	%
Ultrasound	146	
Normal	133	91.1
Urinary obstruction	9	6.2
Congenital anomalies	4	2.7
MCUG	53	
Normal	30	56.6
Grade I reflux	14	26.4
Grade II reflux	4	7.5
Grade III reflux	3	5.7
Grade IV reflux	2	3.8
Other studies		
DMSA	69	46.6
IVU	14	9.5
DTPA	5	3.4
Cystoscopy	2	1.4

MCUG = Micturating cystourethrography

DMSA = 2,3-dimercaptosuccinic acid

IVU = Intravenous urography

DTPA = Diethylene-triamino penta-acetic acid

DISCUSSION

Urinary tract infection in children is a significant source of morbidity. It is generally agreed that children with UTI require further investigation and continuing urinary surveillance to minimize future complications^[11]. Retrospective studies have estimated that 1.2 - 5 % of infants and children will develop symptomatic UTI at least once in their life^[6,9,10]. In our study, about 5.5% of infants and children attending pediatric OPD had UTI. However it is difficult to establish the true prevalence of UTI in infants and children as up to 40% of these infections are asymptomatic and usually patients do not seek medical advice^[12]. Epidemiological investigations showed that males have more UTI than females during the first 3-6 months of life, while females predominate after that time. By the age of five years girls are as much as 50 times more affected than boys^[13], a finding similar to ours. Most of our patients (94.6%) were females. Moreover, circumcised males appear to be at a lower risk at developing UTI perhaps because of low periurethral and urethral bacterial inoculum^[14,15]. This is different from our findings. Fifty percent of our male patients were circumcised. This may be due to the small number of males included in the study.

Children with UTI do not always present with symptoms referable to the urinary tract. Infants may present with subtle symptoms such as irritability or lethargy. Older children may also have nonspecific symptoms such as abdominal pain or unexplained fever^[16,17]. In our study the most common presenting symptoms were fever and lower urinary tract manifestations such as dysuria, frequency, dark urine and foul smell urine (Table 2). They occurred

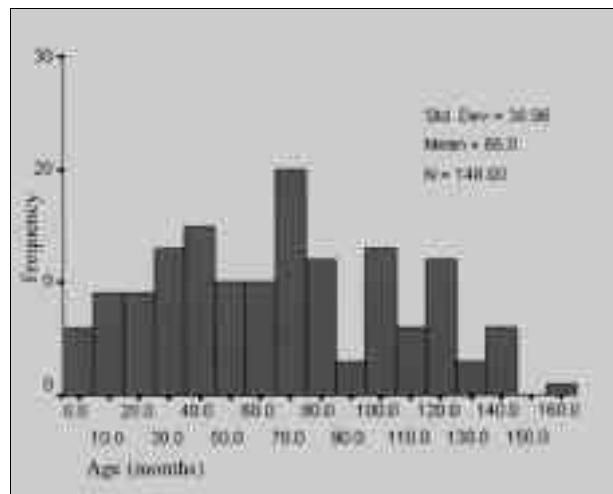


Fig. 1: Age distribution of children with UTI in Al-Jahra Hospital 1996-1999

in 60.8% of cases, while extraordinary manifestations such as abdominal pain, irritability, lethargy and vomiting, occurred only in 5.4%. This may be because of the small number of infants in the study; about 17% of our cases were below two years of age (Fig. 1). Furthermore, we found no signs of upper urinary tract involvement such as loin tenderness, edema or hypertension in most of our cases. One hundred and sixteen patients (77.3%) had no physical signs. This emphasizes the difficulty in determining which children have UTI based on clinical findings, and the need to suspect it even in febrile children with an equivocal source of fever.

Urinalysis can be very helpful in providing immediate information to support the diagnosis of UTI. The presence of bacteriuria (100 colonies/ml) and pyuria (10 WBC/hpf) favors the diagnosis. In our study all patients have positive urinalysis results (Table 3); 125 (84.5%) have bacteriuria, 112 (75.7%) have pyuria and 99 (66%) have positive urine nitrite test. This supports the idea that urinalysis is a good indicator of the presence of UTI. This is contrary to the findings in the literature. Jonathan *et al*^[18] found that in young children with UTI, urinalysis may be negative in 20% of cases. Landau *et al*^[19] mentioned that approximately 30-50% of patients with UTI had no pyuria. The definite method for the diagnosis of UTI is urine culture, but as bagged urine specimens may be contaminated, results must be interpreted in conjunction with urinalysis and clinical setting. However, Newman *et al*^[20] did not find an excess of positive urine cultures among infants whose urine was collected in a bag and suggested that such tests are valid. *E. coli* is the predominant organism found in our patients; it was isolated from 87.8% of cases. This is as the same as in the literature^[16,17,21]. Nonspecific tests, such as CBC, ESR and C-reactive protein, may provide supportive evidence of UTIs

in children with positive urine cultures. But at initial evaluation the usefulness of such ancillary tests is doubtful^[22,23]. In our study, we found white cell count and ESR unhelpful.

For careful evaluation of children with UTI, imaging of the urinary tract is mandatory to exclude structural abnormalities and to identify patients who may develop serious sequelae. The incidence of radiographic abnormalities in children following an initial UTI ranges from 6-57%, depending on the population studied^[24,25,26,27]. Vesicoureteral reflux is the most common associated abnormality, and reflux nephropathy is the important cause of end-stage renal disease^[28]. In our study, vesicoureteral reflux was detected in 23 patients (43%) out of 53 patients who did MCUG (15.5% of the total patients); nine of them (39.1%) had renal scars. On the other hand, renal scars were found in 15 (21.7%) patients out of 69 patients for whom DMSA scans were done (10.1% of the total number of patients); six of those with renal scars (40%) had no evidence of VUR. Other studies showed that VUR was present in 30-50% of children with UTI, and 30-60% of children with reflux have scars^[29,30]. The studies also suggested that only in the presence of infection does reflux cause scarring^[31]. Hence, we agree with other authors^[11,13] that, infection and reflux, should be considered as independent variables either of which alone may not be a major cause of renal damage.

CONCLUSION

The results of the present study show that 5.5% of children seen in the OPD of Al-Jahra Hospital in a 3-year period had UTI. During the three-year period of follow up, no major complications or growth failure was detected in most of the patients. This may be due to early detection and proper management of UTI. However, some of the complications of UTI in childhood are seen after a long time of follow up.

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