



## Bacterial Urinary Tract Infection as Public Health Hazard among children in Basrah, Iraq

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Submitted: 17 January 2023; Accepted: 18 February 2023; Published: 11 March 2023

### ABSTRACT

Urinary tract infection (UTI) is one of the commonest bacterial infections seen by Pediatricians in children. However, diagnosis remains a difficult task probably because its presentation is non-specific and similar to other common illnesses. This study aims to isolate, identify and characterize urinary tract infection causing bacteria and to assess the incidence of UTI among various patients based on age, sex, and another socioeconomic status. Urine samples (N=80) of children below 10 years of age that were suspected of urinary tract infection were sent for routine microscopic examination (GUE). Then urine samples were cultured on different culture media for microbiological investigation. Out of 80 Children who enrolled in this study, 17(42.55%) were male and 23(57.5%) were female. The majority of children in this study were feverish (fever >38°C) (62.5%) and the others had dysuria, frequency, and flank pain (52.5, 45, 40%) respectively. Gram-negative bacteria were the most common uropathogens responsible for UTI in comparison to Gram-positive bacteria. *E. coli* was the common uropathogen from Gram-negative bacteria followed by *Klebsiella* and *Pseudomonas* (44%, 12%, 4%) respectively, *Staphylococcus aureus* also appeared in high percent than other Gram-positive bacteria. In Conclusion, during the period of this study, *E. coli* is the most commonest uropathogen in children with UTI.

**Keywords:** *Common, Suspected, Culture, Bacteria.*

### INTRODUCTION

Urinary tract infections (UTIs) in children are commonly seen in the emergency department and pose several challenges to establishing the proper diagnosis and determining management (Bhat et al 2011). UTI may be classed as either an upper UTI – if it's a kidney infection or an infection of the ureters, the tubes connecting the kidneys to the bladder or a lower UTI – if it's a bladder infection (cystitis) or an infection

of the urethra, the tube that carries urine from the bladder out of the body.

Bacteria frequently invade the distal urinary tract but, in most individuals, infection is not established, due to an efficient antibacterial host defense (Nielubowicz, Mobley 2010). However, in patients with voiding dysfunction, malformations, and or molecular immune defects, infection is facilitated, and even bacteria of reduced virulence may establish infection (Ragnars et al 2011).

Most children who develop UTI have a normal urinary tract, and to establish bacteriuria and symptomatic infection, specific virulence factors are required (Bhat et al 2011). The prevalence of UTI in infants younger than 60 days with a temperature greater than 100.4°F (38°C) was 9%. (Zorc et al, 2005). By seven years of age, 8% of girls and 2% of boys will have at least one episode (Williams et al 2006).

Clinical signs and symptoms of a UTI depend on the age of the child. UTI in infants can manifest as diverse and non-specific symptoms. Fever, sepsis, lethargy, prolonged jaundice (Garcia & Narger, 2002), hematuria, poor feeding, vomiting, diarrhea, irritability, failure to thrive, cloudy or malodorous urine (Gauthier et al 2012), and crying on passing urine are the possible presentation in newborn and young infants. Older children can verbalize better specific symptoms, such as dysuria, frequency, urgency, new onset urinary incontinence, abdominal or flank pain, suprapubic discomfort, and vomiting. In older children, the presence of specific urinary symptoms can be used as a criterion for further examination (Mori, 2007). Although individual symptom and sign were helpful in the diagnosis of UTI, no individual symptom/sign or any combination of them was sufficient enough to identify children with UTI (Shaikh, 2007). Physical examination findings can be nonspecific but may include suprapubic tenderness or costovertebral angle tenderness.

Common uropathogens include *Escherichia coli* is the most common bacteria that causes UTIs in all ages, accounting for 54% to 67% of UTIs in children. *Klebsiella* (6%–7%), *Proteus* (5%–12%), *Enterococcus* (3%–9%), and *Pseudomonas* (2%–6%) are other common causative organisms (Bell and Mattoo, 2009).

The present study was designed for the detection of common bacterial pathogens associated with UTI which was achieved by isolation, identification, and characterization of urinary tract infection-causing bacteria, and determined the incidence of UTI among various patients based on age, sex, and socioeconomic status.

## MATERIALS AND METHODS

This study was done during the period from December 2017 to April 2018. Children who were considered to be at risk of UTI were enrolled in this study. Urine samples were collected from those children (N=80) and then analyzed by examination of the urine microscopically and microbiologically for achieving the principle aim. All urine specimens were collected in sterile containers and sealed tightly to avoid any bacterial contamination. Data of age, sex, residency, and other demographic criteria were recorded also risk factors, signs & symptoms of urinary tract infection were included in a questionnaire model. Then the samples were sent to the laboratory for a urinalysis and bacterial cultivation.

### *Urinalysis (GUE)*

Microscopy screening of the components of urine was done and these are very useful in the evaluation and for rapid screening of UTI. These include: color, turbidity, and presence or absence of blood cells were performed. The result of (GUE) that contain three pluses (+++) or more of pus cells are considered an indication of urinary tract infection.

### *Bacterial cultivation*

Urine specimens were collected in a sterile container and transported to the laboratory. Urine samples were cultivated on MacConkeys agar, Mannitol Salt agar and Blood agar for isolation of Gram +ve and Gram -ve bacterial species. Plates were then incubated aerobically at 37° C for 24-48 hours. Bacterial growth was then assessed and biochemical tests were used as needed for further identification of bacterial isolate according to standard bacteriological procedure (Forbes et al, 2008).

### *Statistical analysis*

All data were analyzed statistically by using Statistical Package for Social Sciences (SPSS) version 24 to evaluate the significance of the data.

**RESULTS**

Eighty children in this study with classical urinary tract symptoms were checked for urinary tract infections, 30(37.5%) were with age  $\geq 5$

years and 50 (62.5%) were in the age range 6-10 years. Out of 80 children, 34(42.5%) were male while 46(57%) were female. (Table-1)

**TABLE 1:** Distribution of children with UTI according to their age groups

Age groups	Sex		Total	Percent
	Male	Female		
$\geq 5$ years	12	18	30	37.5%
6-10 years	22	28	50	62.5%
Total	34(42.5%)	46(57.5%)	80	100%

P= 0.726

According to table-2, six children appeared with a family history of UTI (two male and ten female). All enrolled children were outpatient

and without any medication also any child with antibiotic treatment was excluded. Besides that those children showed variable symptoms.

**TABLE 2:** Distribution of children with UTI according to their General Information

Variables	Sex		Total	Percent
	Male	Female		
Family Hx	2	10	12	15%
Outpatient	34	46	80	100%
Inpatients	0	0	0	0
Symptom	34	46	80	100%
Medication	0	0	0	0

The majority of children in this study were feverish (fever  $>38^{\circ}\text{C}$ ) (62.5%) and the others had dysuria, frequency, and flank pain (52.5, 45,

40%) respectively. Other symptoms of UTI occur in less than 2.5% like both hematuria and vomiting (Table-3).

**TABLE 3:** Distribution of signs and symptoms in children with UTI

Symptoms	Female	Male	Total	Percentage	P value
Fever	28	22	50	62.5%	0.72
Frequency	16	20	36	45%	0.03
Dysuria	24	18	42	52.5%	0.94
Flank pain	10	22	32	40%	0.000
Hematuria	2	0	2	2.5%	0.5
Vomiting	2	2	4	5%	1

According to data presented in table-4, thirty cases (37.5%) showed no growth upon culture, while 50(62.5%) cases showed bacterial growth, (Table- 4).

**TABLE 4:** bacteria growth among children with UTI

Sex	Bacterial growth		Total
	-ve (%)	+ve (%)	
Male	16 (53.33)	18 (36)	34
Female	14 (46.67)	32 (64)	46
Total	30 (37.5)	50 (62.5)	80 (100%)

P= 0.12

The most common uropathogens were estimated to be Gram-negative bacteria (60%) followed by Gram-positive bacteria (40%), as shown in table-5. The Common bacterial isolates were *E. coli* (44%), *S. aureus* (24%), *Klebsiella* spp., *S. epidermidis* (12%) for each, *Pseudomonas* spp., and *Streptococcus* spp. (4%) for each.

**TABLE 5:** Frequency of bacterial species in children with UTI

Type of Bacteria	No.	Percentage
Gram-negative bacteria	(30)	(60)
<i>E. coli</i>	22	44%
<i>Klebsiella</i>	6	12%
<i>Pseudomonas</i>	2	4 %
Gram-positive bacteria	(20)	(40)
<i>S. aureus</i>	12	24%
<i>S. epidermidis</i>	6	12 %
<i>Streptococcus</i> spp (Beta hemolytic)	2	4 %
Total	50	100%

The findings in Table-6 revealed that *E. coli* was the common uropathogen from Gram-negative bacteria followed by *Klebsiella* and *Pseudomonas* (44%, 12%, 4%) respectively, *Staphylococcus aureus* also appeared in high percent than other Gram-positive bacteria. (Table-6)

**TABLE 6 :** Distribution of bacterial species according to children's gender

Type of Bacteria	Male No. (%)	Female No. (%)	Total No. (%)
<i>E. coli</i>	14 (63.64)	8 (36.36)	22 (44)
<i>Klebsiella</i> spp.	6 (100)	0 (0)	6 (12)
<i>Pseudomonas</i> spp.	2 (100)	0 (0)	2 (4)
<i>S. aureus</i>	0 (0)	12 (100)	12 (24)
<i>S. epidermidis</i>	4 (66.67)	2 (33.33)	6 (12)
<i>Streptococcus</i> spp.	0 (0)	2 (100)	2 (4)
Total	26 (52)	24 (48)	50 (100)

P= 0.000

### DISCUSSION

Urinary tract infection (UTI) is a common problem and a major clinical importance owing to considerably high morbidity and mortality rates among children (Mortazavi and Shahin, 2009). In this study out of 80 children, 46(57.5%) were female (Table-1), which mean that the most common problem was in female more than in male. This result is comparable to that study by Ojha & Aryal, (2014). The prevalence of UTI was higher in females than that in males for many reasons like female short urethra.

In this study fever was present in 62.5% of the cases, followed by dysuria in about 52.5% of the patients with UTI, this is comparable to other studies (Brkic et al, 2010; Malla et al, 2010). The Clinical symptoms of UTI usually include frequency, dysuria, pyuria, abdominal pain, back pain, fever, or urgency (McLoughlin, & Joseph, 2003). Cultivation of Urine is regarded as a gold standard for diagnosing UTI. Among the 25 culture positive in this study Gram-negative Escherichia Coli was isolated in 22(44%) in comparison to Gram-positive bacteria. This result is comparable to the study of Farajnia & Alikhani, in which they had shown Escherichia coli 80%, Klebsiella spp 2.7%, Enterobacter spp 2.7%, Proteus spp 2.7%, Pseudomonas aeruginosa 6.7%, Staphylococcus aureus 1.3%, Staphylococcus Saprophyticus 4% in the age group (0-9) (Farajnia & Alikhani, 2008). Similarly, the result of the current study was comparable to the study of Ipek et al (2011) as they stated that E. coli is in high frequency (81.7%). Parents must be careful in noticing UTI symptoms in their children as children cannot express their feelings well as adults, and as a result, they should take their children immediately to the doctor to avoid any complications that may result from any delay in both diagnosis and treatment of these children.

### CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

### ACKNOWLEDGMENTS

The authors would like to thank all participated Children and their parents for kind help.

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