Descriptive Study of Urinary Tract Infections among Children

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Abstract:

Background: Urinary tract infections (UTIs) are the most prevalent bacterial infections affecting approximately 1.7% of boys and 8·4% of girls.

Objectives: To determine different variables that associated with an increased risk of UTI in children.

Methods: A descriptive cross-sectional study conducted on 150 convenient urine samples were obtained from child's teaching hospital in Baghdad city from children under 12 years during period of 20 September 2021 to 20 December 2021. The inclusion criteria include: children between 1-12 years old for both sexes with clinical evidence of UTIs diagnosed by physicians attending this hospital. The exclusion criteria were: children under one year, those with genetic defect of urinary tract infection.

Results: Highest rates of UTIs were in the age group of <1-4 years; 77 (51.3%) of them were male with male to female ratio 1.05:1. 16.7% of children whose mother had primary education were diagnosed with UTIs. 22% of positive culture test occur in those wiping from the front as compared with 27.3% wiping from back. from behind. The positive culture test found in 33.7% of those not circumcised in comparison with 19.4% of those undergone circumcision. *Escherichia coli* detected in 31 (20.7%) of studied sample.

Conclusion: Urinary tract infections most prevalent among boys under 12 years, in particular those who did not undergone circumcision. E. coli among the highest frequent bacteria detected in the urine cultures of children. It is recommended to educate mothers during pregnancy and after delivery regarding importance of circumcision to boys and proper washing methods.

Key words: *Urinary tract infection, Bacteriuria, children.*

Introduction:

Urinary tract infections (UTIs) are the most prevalent bacterial infections in individuals. The majority of morbidity and hospital admission globally occur as a result of UTIs. It affecting approximately 1.7% of boys and 8·4% of girls. This infection affect boys and girls equally when they are in 12 months of life or less, but after this age the rates reverse and highest percentages detected in girls [1- 3]. The infection may affect the upper urinary tract (pyelonephritis) or the lower urinary tract (cystitis). Unfortunately, it may be difficult to distinguish one from another based on clinical symptoms and signs, especially in infants and young children. Both of these two conditions refer to as urinary tract infections [4].

Appropriate diagnosis and effective treatment are vital in reduction of morbidity that associated with this condition. Throughout infancy symptoms of UTI usually nonspecific; i.e. unexplained fever, most common, irritability, appetite loss, anorexia, vomiting, and recurrent abdominal pain [5, 6].

Wiping (from back to front), circumcision conditions, nappy use, obstructive uropathy, neurogenic bladder, poor personal hygiene and constipation were found to be potential factors for UTI [7, 8]. Circumcision is the most common surgical procedure carried out on children particularly during infancy [9]. It has been shown epidemiologically to reduce the risk of UTI by up to 90% [10].

Bacteriuria colonization with single or multiple micro-organisms in a urine specimen that may associate with symptoms (symptomatic) or without symptoms (asymptomatic) urinary tract infection (UTI) [11]. Different kinds of bacteria can be detected in urine; *Escherichia coli* is the most common followed by *Klebsiella pneumoniae*, *Enterobacter* spp, and *Pseudomonas* [12].

Consequently, the purpose of the current descriptive study is to deliver a comprehensive review of the epidemiology and characteristics of UTIs in children less than 12 years who attending child's teaching hospital in Baghdad city and determine the risk factors of UTIs caused by bacterial organisms.

Subjects & Methods:

A single center cross sectional study conducted over three month's period between 20 September 2021 to 20 December 2021. Convenient (non- probability) of 150 urine samples were obtained for this study from children attending to Children Teaching Hospital in Baghdad City.

The inclusion criteria were as follows: children between 1-12 years old for both sexes with clinical evidence of UTIs diagnosed by physicians who attending this hospital.

The exclusion criteria of this study include: 1- children under one year, 2- those with genetic defect of urinary tract infection.

Data were collected through direct interview with mothers of children using structured

questionnaire, five minutes were required for each mother. First part of questionnaire concerned with demographic variables (age, gender, educational level of mother). Second part comprises data as regard with (personal habits, symptoms, history of circumcision). Third part was about culture findings. After direct interview the urine sample collected and examined.

Urine sample: Mid- stream urine collected from each patient in sterile containers and transferred to the microbiology laboratory processed within one hour for culturing according to standard methods. All specimens were inoculated on Macconky agar and Blood agar. After incubation at 37 c the bacterial colonies were differentiated according to colony morphology and gram staining, haemolysis pattern, catalase and coagulase test for staphylococci and streptococci identification the Macconky agar plate were checked for non- lactase fermentation colonies. Suspected enteric pathogens for all media were identified biochemically using standard bacteriological method and the Apl 20E system. In addition, Lactase fermenting and any non-Lactase fermenting colonies typical of E. coli were selected from Macconky agar plate and identify. Confidentially and anonymity were guaranteed for each participant.

Statistical analysis was used to describe the qualitative as well as quantitative variables. Statistical analysis was performed using SPSS software version 26.

Results:

A total of 150 children with urinary tract infections (UTIs) were involved in the current descriptive study, 67 (44.7%) were with infection and the rest 83 (55.3%) without infection. Highest percentages of UTIs were in the age group (1-4 years) whereas lowest percentages found in (≥10 years); 77 (51.3%) of them were male and 73(48.7%) were female with male to female ratio 1.05:1. As regard to educational level of mother, 28.7% had primary education; of them 37.3% their child had UTI, 33.4% had intermediate and secondary level of education 38.1% were graduated as shown in table (1).

Table 1: The distribution of studied sample according to presence of infection.

Age group (years)	**Infection**				**Total**	
	Yes (n=67)		**No (n=83)**			
	No	%	No	%	No	%
<1---4	31	46.2	38	45.7	69	46.0
5---9	24	35.8	37	44.5	61	40.7
≥10	12	17.9	8	9.6	20	13.3
Gender						
Male	38	56.7	39	46.9	77	51.3
Female	29	43.2	44	53.1	73	48.7
Educational level of mother						
Primary	25	37.3	18	21.6	43	28.7
Intermediate	13	19.4	12	14.4	25	16.7
Secondary	10	14.9	15	18.07	25	16.7
Graduated	19	28.3	38	45.7	57	38.1

Table 2 shows some health habits and results of culture test, 74 (49.3%) were positive and the rest 76 (50.7%) were negative. Culture results distribution according to health habits showed that 44.5% of positive culture test occur in this washed from the front as compared with 55.4% washed from behind.

Table 2: The distribution of children according to some health habits and culture.

	Result of culture test				Total	
	Positive (n=74)		Negative (n=76)			
Wiping way	No	%	No	%	No	%
From front	33	44.5	36	47.3	69	46.0
From back	41	55.4	40	52.6	81	54.0
Times child's underwear changed						
1-2 times	49	66.2	53	69.7	102	68.0
3-5 times	25	33.7	23	30.2	48	32.0

The positive culture test found in 63.4% of those not circumcised in comparison with 36.5% of those undergone circumcision. Different bacterial isolations were detected in the results of culture test in front of them E. coli, Pseudomonas spp., Klebsiella spp., Proteus (41.9%, 16.2%, 12.2%, 2.7%) respectively; the remaining (Staphylococcus spp 18.9%, Morganella 5.4%, Streptococcus spp 1.4%, Enterobacteria asburiae 1.4%) (Table 3& 4).

Table 3: The distribution of circumcision status and result of culture test among boys.

	Result of culture test				Total	
	Positive (n=41)		Negative (n=36)			
Circumcision status	No	%	No	%	No	%
Non-circumcised	26	63.4	0	0	26	33.7
Circumcised	15	36.5	36	100	51	66.3

Table 4: Type and percentages of bacterial isolates (n=74)

Type of bacterial isolates	No	%
Gram negative		
Escherichia coli	31	41.9
Pseudomonas	12	16.2
Klebsiella	9	12.2
Proteus	2	2.7
Gram positive		
Staphylococcus spp	14	18.9
Morganella	4	5.4
Streptococcus spp	1	1.4
Enterobacteria asburiae	1	1.4

Discussion:

UTIs are a term used for a wide range of clinical disorders, from asymptomatic bacteriuria to kidneys infection and sepsis. The majority of cases caused by bacteria particularly E. coli. The high prevalence and the possibility of recurrence of the infection and the long-term serious adverse events in children have caused to be of special consideration specifically in children [13].

The Researchers demonstrate that higher percentages of urinary tract infections were among girls; increased susceptibility of girls to UTI might be explained by the relatively shorter length of the female urethra and the regular heavy colonization of the perineum by enteric organisms [14].

The current study shows that girls 43.2% affected less common than boys 56.7%; in Iran study by Salarzaei et al., also found the same results this may be due to increased boy's sample in comparison with female [15].

Highest percentage of infection was in children whose mother had primary education while the children have graduated mother their infection were less. Study done by *Ahmadi et. al.* found the opposite results [16].

The highest percentages in primary educated mother may due to their lower level of health education as regard to healthier habits. One of the major risk factors of urinary tract infection is washing method; the current study detects that positivity of culture test, 44.5% occur in those washed from front to back while highest positive findings (55.4%) was detected in those washed by the opposite way; studies in other countries agree with these findings. That washing from front to back consider protective measures because it decreases the risk of transferring bacteria to urethra [17].

In several religious, circumcision performed nearly for all male newborns, circumcision consists of surgical removal of the foreskin (or prepuce) from the penis. Despite the medical benefits of this procedure, it still controversial [18]. It may consider as preventive measures for several health conditions consist urinary tract infections [19]. One study performed by Mukherjee *et al.* show that circumcision contributes in reduction of 83% of UTI [20]. On the other hand, Saeed *et al.*, demonstrate that prevalence of UTIs in uncircumcised boys was 76.9% compared to 23.1% in circumcised boys [21].

Not far from these results, as the current study proved the same results, 63.4% of uncircumcised boys show positive culture test whereas 36.5% of circumcised boys have the positive results. Results of culture test show predominance of gram negative bacteria; E. coli followed by Pseudomonas and Klebsiella species 41.9%, 16.2% and 12.2% respectively. Gram positive microorganisms such as Staphylococcus spp, Morganella, Streptococcus spp, Enterobacteria asburiae were less common; other studies show the same percentages [22- 24].

E. coli found in water sources, such as private wells, that have been contaminated with feces from infected humans or animals. Waste can enter the water through different ways, including sewage overflows, sewage systems that are not working properly, polluted storm water runoff, and agricultural runoff [25]. Moreover; the Fimbriae help bacteria attach to the uroepithelial cell lining and thereby remain in the urinary tract despite the flow of urine [26]. Uropathogenic bacteria also have a range of other virulence factors that enable them to cause infection. These factors include haemolysin, a specific protective O antigen on the carbohydrate end of the lipopolysaccharide, capsule K phenotypes, and different siderophores enabling the bacteria to get essential nutrient iron [27]. Other bacterial species such as Klebsiella and Pseudomonas do not have such abilities and often rely on impaired host defense to cause an infection.

In conclusion, urinary tract infections most prevalent among boys under 12 years, in particular those who didn't undergone circumcision and their mother have primary education. Circumcision and appropriate washing ways are the important and costless prevention methods of UTIs. E. coli among the highest frequent bacteria detected in the urine cultures of children.

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