

Causes and Treatment of Urinary Tract Disorders Among Children in Diwaniyah Province

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Abstract

Background: Urinary tract disorders are among the most important health problems for humans during childhood and it is often difficult to diagnose it early, especially in newborns, and for the importance of this topic, the study was designed to know the propagation of urinary tract infection (UTI) among children in Al-Diwaniyah province, in addition to determining the causes and the appropriate treatment for them. Methods: The current study includes data collection and medical examinations of 122 children suffering from UT disorders. The current study relied in samples collection on the diagnosis of the specialist doctor, medical history and clinical examination as well as the lab examination of the urine sample. Results: Our study included 122 children with UT disorders their ages ranged from 2 day to 15 years, with a mean age of 5,617 years. Nearly all the children infected with UTI were boys (52%) and girls (48%). In the current study, the duration of UT disorders ranged between 1-17 days, and the results showed that the main cause of UTI in children (64%) was bacteria, adding to kidney problems (12.2%), urethral obstruction (14%), and sand/ stone in the kidney (5%) . Our results also showed that 81% of females had bacteria as a main cause of UTI in addition to kidney disorders (10%). Moreover, 43% of children suffer from recurrent UTI, while 57% do not suffer from it. On the other hand, the results of the study demonstrated that antibiotics were the most used treatment for UTI, as they were prescribed by 95%, and meropenem and ceftriaxone were the most appropriate treatment. We also found the use of NSAIDs such as paracetamol by 57%, while surgical intervention such as circumcision was the best treatment is in 8% of male cases. In conclusion, it must be mentioned that UTI appeared in a high rate in children in the city of Diwaniyah, where 122 cases were identified , and the main cause of UTI in children was bacterial infection that mainly treated by meropenem and ceftriaxone.

Keywords: UTI, Treatment, Bacteria, Children, Antibiotics, Disorders

1. Introduction

Urinary tract disorders considered one of the common pediatric problem. It troubles the child, heeds the parents, and leads to kidney damage [1]. UT disorders mainly result from microbial information or/ and congenital malformations and that disorders effected by baby gender. The symptoms of the urinary tract are the child's repeated desire to urinate, or his involuntary urination in additional to burn during urination. For infants, the symptoms of urinary tract infections appear in the form of sensitivity to touch, gray discoloration of the skin, or high temperatures for no apparent reason [2,4]. Clinical assessment found that a symptomatic UTI are highest in boys and girls during infancy and strikingly decrease afterwards [2,3]. Urinary tract infection with bacteria is one of the most widespread infections among children of all ages, although it is the most common, but it is neglected, which in turn leads to several unwanted complications due to ignoring the disease or lack of diagnosis. In children urinary tract infections cause

is the existence of bacteria or fungi within the urinary tract [5,6].The most common bacterial etiology for neonatal UTIs, similar to other age groups, is *E. coli* . However, some studies found that the overall burden of disease by *E. coli* was lower in this age group (about 50% of all positive cultures) compared with older age groups in which *E. coli* is responsible for up to 80% of UTIs [7,8]. In particular, male infants with vesicoureteral reflux were more likely to present with UTIs caused by other pathogens. These pathogens include other gram-negative organisms: *Klebsiella pneumoniae*, *Klebsiella oxytoca*, *Proteus mirabilis*, *Proteus vulgaris*, *Enterobacter aerogenes*, *Pseudomonas aeruginosa*, and *Morganella morganii* [9,10]. However, this finding remains controversial; Moreover previous study included mostly premature infants, showed a less than 1% incidence of coagulase-negative staphylococci UTI. *Candida* UTIs occur more commonly in extremely premature infants [11]. Also other study reported that 42% of UTIs in a neonatal intensive care unit were caused by *Candida* spp, with *Enterobacter cloacae* being

the second most common [12]. The reason for the spread of urinary tract infections in a greater percentage in females compared to males is due to the short length of the urethra in females, which facilitates the access of bacteria to the upper urinary tract [12,13]. The hazard of urinary tract infections is also increased in uncircumcised males due to the accumulation of bacteria around the skin of the foreskin [14]. Some children may suffer from recurrent infections as a result of infection with bacteria that are resistant to antibiotics, while others suffer from infections as a result of non-bacterial infection, which may be accompanied by problems or complications, leading to high temperatures and be treated in different ways without the need for antibiotics [15,16]. Because of the importance of this topic, this study was designed to find out the causes of urinary tract disorders and their prevalence among children in Al-Diwaniyah province, in addition to identify the bacterial cause of infections and determining the appropriate treatment for each type of these complications in the urinary system.

2. Materials And Methods

Study design and sample collection: The study is a cross sectional study included the collection of data and medical examinations from 122 children suffering from UTI with age from one day to 15 years, where samples were collected during the period from 2/1/2022 to 1/4/2022 in the Maternity and Children’s Teaching Hospita and the outpatient clinics, where the following information was collected:

1. The age and gender of the patient
2. Signs and symptoms of the disease
3. Treatment
4. Duration of inflammation
5. Recurring inflammation
6. Chronic diseases

Urinalysis: It is required to give a urine sample to check for the presence of pus and / or bacteria in the urine because normal urine is free of pus and bacteria. Urine tests include use Urinalysis Reagent Strip by put the tape in the urine for 20 seconds, extract it and leave it for 60 seconds, and compare the colors on the box.

General Urine Examination: We collected urine to be examined in a sterile test tube and then put the tube in the centrifuge for five minutes until the process of separation is completed inside a

device, after which we get rid of the filtrate. Then we put the precipitate on the slide and then examine it under a light microscope

Clinical Examination: In the selection of pathological cases, the current study relied on determining the malformations or obstructive of urinary tract infections by conducting several clinical examinations as X ray and CT scan for the urinary system.

Isolation & identification of Bacterial isolates: Urine samples were diluted and cultured on (Blood agar, MacConkey agar, Eosin Methylene Blue agar and Sabouraud Dextrose agar) for isolating the microbes that causing of urinary tract infection. Identification of causative agent depended on the shape of the colonies in Sabouraud Dextrose agar, hemolysis on blood agar, lactose fermentation on macConkey agar and pH indicator dyes in Eosin Methylene Blue agar as well as biochemical tests.

Antibiotic Sensitivity Test:This test was performed by placing antibiotics disk on top of Muller-Hinton medium that cultured with the bacteria that diagnosed in the previous steps. If the bacteria are sensitive to antibiotics, a clear ring or dampening area will appear around the antibiotic tablets, indicating their poor or no growth.

Where the sensitivity or resistance of bacteria to antibiotics is determined based on fixed measures that include clarifying the growth of bacteria, whether resistant, intermediate or sensitive [17].

Statistical Analysis:The results of the current study were analyzed using Excel 2010 and the Statistical Package for Social Analysis [SPSS 19] program, and the probability of more than 0.05 was considered statistically different.

3. Results

This cross-sectional study included 122 children with urinary tract infection, their ages ranged from day 2 to 15 years, with a mean age of 5.617 years as shown in Table (1). Most children (67%) have UT disorders at age range from 10 to 15 year followed by ages from 2 day to 5 years (19%). Moreover, this study showed that most of the children infected with UTI were males with a percentage of 52% as in Figure (1), while the percentage of females was 48%.

Table (1): Show age characteristics of patients

Age characteristics	
Age range	2 day -15 year
Age mean	5.617
Standard deviation	4.497
Standard error	0.407
Age groups	N (%)
2 day – 5 year	23 (19)
5 -10 year	17 (14)
10 – 15 year	82 (67)
Total number	122

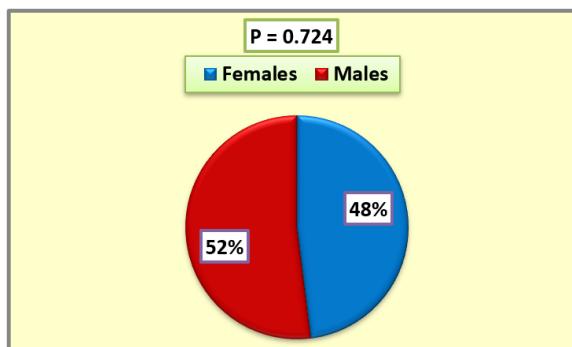


Figure (1): Cases distribution according to patients gender

The current study showed that the duration of urinary tract disorders ranged from 1-17 days, with an average of 9.79 days, as shown in Table (2). Bacterial infection was the main cause (64%) of urinary tract problems in children, in addition to

kidney disorders (12.2%), urethral obstruction (14%) and sand and/ or stones in the kidneys (5%), as shown in Table (3). Also, our results showed that 81% of females had a urinary tract infection caused by bacteria, adding that kidney disorders appeared in 10 and cystitis in (3%). Furthermore, bacteria also appeared as the main factors in urinary tract infection in males (39%), but in a lesser percentage than in females (P = 0.009). Urethral obstruction (17%) was also from the clear causes of urinary tract problems in males and kidney disorders (17%) as in the Table (4) where we notice urinary problems. The results of urine culture, microscopic and biochemical examinations showed that E.coli, klebsiella sp, staphylococcus sp, Proteus sp, enterobacter and candida sp are the uropathogens of 50%, 20%, 11%, 9%, 4%, 2% and 2% of cases as in Figure (2).

Table (2): Show duration of UTI among children

Properties	Duration of UT disorder/day
Range	1-17
Mean	9.79
Standard deviation	4.22
Standard error	0.54

Table (3): Show causes of UT disorders

Causes of UT disorders	Number	Percentage
Bacterial infections	78	64
Kidney disorders	15	12.2
Cystitis	4	3.2
Sand and stones	6	5
Urethral obstruction	17	14
Ureteral stricture	2	1.6
Total number	122	100

Table (4): Show distribution of UT disorders according to patients gender

Causes of UT disorders	Males (N =59)	Females (N=63)	P value
Bacteria	23 (39)	51 (81)	0.009
Kidney disorders	10 (17)	6 (10)	0.052
Cystitis	3 (5)	2 (3)	0.620
Sand / stones	5 (9)	1 (2)	0.058
Urethral obstruction	10 (17)	0 (0)	0.041
Ureteral stricture	2 (3)	1 (2)	0.843
Urethral obstruction + bacteria	3 (5)	0 (0)	0.074
Kidney disorders + Sand / stones	3 (5)	1 (2)	0.540

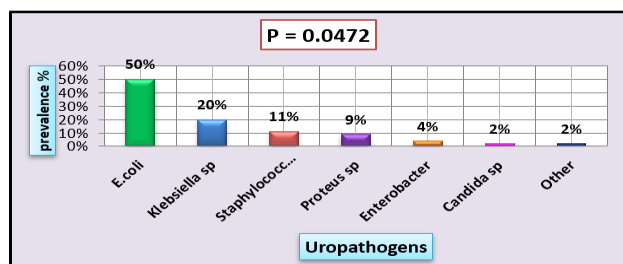


Figure (2): Show causative pathogens of UTI

The current studies showed that 43% of children suffer from recurrent infections, while 57% of them haven't previously been exposed to a urinary tract infection, as this was their first visit to the Urological Hospital as in Figure (3). On the other hand, we found that most of the recurrent cases of urinary tract infection (58%) were in males, while 42% were in

females, as shown in Figure (4). Moreover, Bacteria were responsible for the recurrent infections, as 72%, 13%, 10%, 3% and 2% of those recurrent infections were due to E.coli, klebsiella sp, staphylococcus sp, Proteus sp and Enterobacter respectively, as shown in Figure 5.

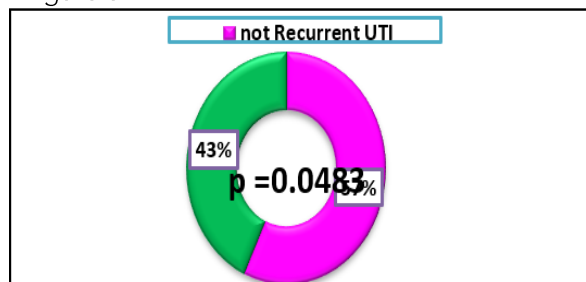


Figure (3): Show prevalence of recurrent of UTI among patients

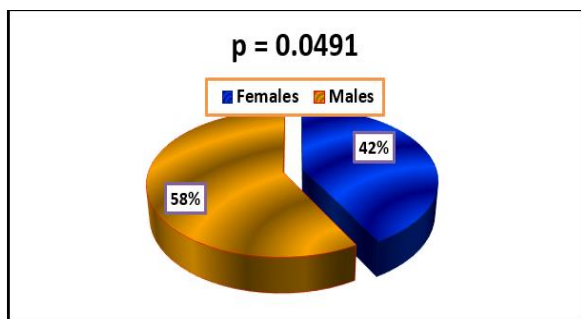


Figure (4): Show distribution of recurrent UTI according to patients gender

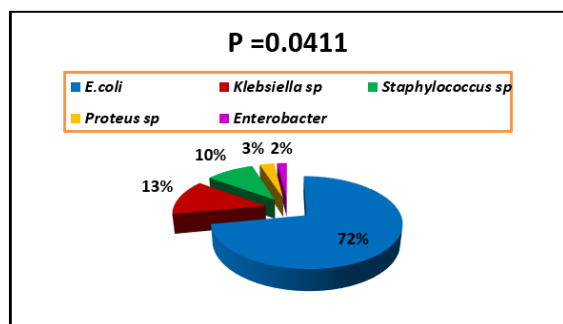


Figure (5): Show bacterial genus that associated with recurrent UTI

The results of the current study exhibit that antibiotics are the most used treatment for urinary tract infections, as they were prescribed by 95% of doctors. We also found the use of non-steroid anti-inflammatory drugs (NSAIDs) such as paracetamol in 57%, where surgical intervention such as circumcision was the best treatment in 8% of cases as in Figure 6.

Antibiotics sensitivity test showed that bacterial infections are more sensitive to many if Antibiotics as in Figure 7. Meropenem, ceftriaxone, cefotaxime and cephalixin are the best treatment for bacterial infections because of have the highest effects at rates 90%, 89%, 80% and 79% respectively. Moreover, Fluconazole affected on 85% of fungal infections.

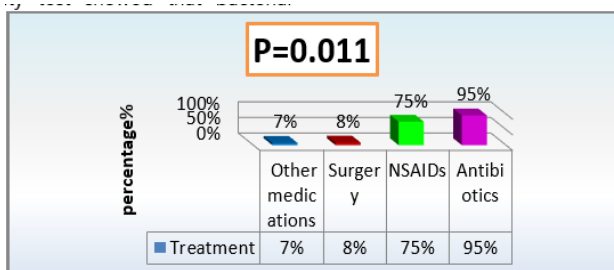


Table (6): Show treatment of UTI in children

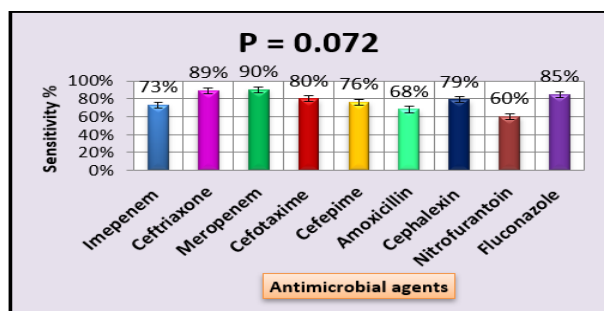


Figure (7): Results of antibiotic sensitivity test

4. Discussion

The outcome of the current study displayed an increase in the incidence of UTI among children, especially males, in Al-Diwaniyah province, where most cases of UTI were caused by bacteria entering the urethra and moving upwards to the bladder and sometimes to the kidneys. Rarely, severe cases, bacteria can travel from the kidneys into the bloodstream, causing an infection in the bloodstream (sepsis) or infection in other parts of the body [18,19]. Some previous studies have shown that male children are more susceptible to UTI in infancy. In the later stages, females are more susceptible to UTIs [20,21]. Our study does not agree with previous studies that found a higher prevalence of UTI in females compared to males due to the shorter urethra length in females, which makes it easier for bacteria to reach the upper urinary tract. Previous study showed an increased risk of UTI in uncircumcised male babies (due to bacteria buildup around the skin of the foreskin), premature babies, and young children with severe constipation (because constipation may affect normal urine flow) [22,23]. In a Swedish study, the attack rate for at least one UTI by seven years of age was 8.4% in girls and 1.7% in boys. Previous research has shown that UTIs in older school-aged children and adolescents are different from UTIs in adults. However, it's common for younger infants and young children with UTIs to have anatomical abnormalities of the urinary system that increase their risk of UTIs [24]. On the other hand, the current study showed that 43% of cases are caused by recurrent infections, especially in boys, and this may be due to the fact that the bacteria that cause this infection are resistant to antibiotics, or it may be due to the wrong diagnosis and treatment. We also found that narrowing of the ureter or urethra is always associated with recurrent disorders and infections in the urinary tract [18,24,23].

Most pediatric UTIs are caused by gram negative coliform bacteria arising from fecal flora colonizing the perineum, which enter and ascend the urinary tract. In current cases E.coli is the most common uropathogen, responsible for 50% of pediatric UTIs but this percentage is low in compared with other studies [25,26]. Uropathogenic E.coli strains possess specific properties, such as fimbriae to attach to the uroepithelial cell surface, to allow them to overcome host defenses. Other common uropathogens include Klebsiella, staphylococcus, Proteus and Enterobacter [27].

In this study, anatomical malformations or abnormalities as urethral obstruction and ureteral stricture detected in some cases especially boys. Anatomical abnormalities include vesicoureteral reflux, an anomaly of the ureter that allows urine to flow up from the bladder to the kidneys, and a number of conditions that impede urine flow. In other study, anatomical abnormalities are present in about 50% of newborns with UTIs, and about 20-30% of school-aged children with UTIs [28,29].

Statistics indicate that about 50% of infants and preschool children with a urinary tract infection (especially those with a fever as well) have both a bladder infection and a kidney infection. If the kidneys are frequently infected, and the reflux is severe, about 5-20% of children will develop scarring in the kidneys. If reflux is simple or absent, a small percentage of children will develop kidney scarring. Kidney scarring is of concern because it can lead to high blood pressure and impaired kidney function in adulthood [30,31].

The current study showed that antibiotics are the most commonly used treatment to eliminate bacteria that cause inflammation, in addition to Paracetamol to reduce the temperature. The treating doctor determines the type and duration of the antibiotic according to the disease condition, the age of the child and the type of microbe, in addition to the bacteria's sensitivity to the antibiotic; All of these factors contribute to the success of the treatment, and the results appear quickly after a day or two at the latest, but it can be longer than that in the event of a congenital defect in the child's urinary system, such as a blockage, stenosis, or regurgitation in the urinary tract. It is necessary to adhere to the doctor's instructions, to give the child antibiotics as prescribed, and to complete the course of treatment even if his condition improves [32,33,34].

In some cases, the doctor requests a new urine test after completing the treatment in order to make sure that the infection is completely gone, which ensures that the disease will not reappear or spread to other parts of the body. On the other hand, some cases, especially in males, require surgical intervention, such as circumcision, to get rid of ureteral obstruction [35,36].

5. Conclusion

Urinary tract disorders are common problems during childhood, from newborns up to 15 years, the most prominent of these disorders are bacterial infections and congenital malformations of the urinary tract. Where we found that *E. coli* is the main cause of urinary tract infection, especially recurrent infections, and meropenem and ceftriaxone were the most appropriate treatment for it. On the other hand, we found that surgical procedures as circumcision is the most successful surgical intervention in solving problems of obstruction or abnormalities of the urethra in males.

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