



URINARY TRACT INFECTIONS AMONG CHILDREN BELOW FIFTEEN YEARS OLD IN KIRKUK PEDIATRIC HOSPITAL

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Article history:	Abstract:
Received: August 8 th 2025 Accepted: September 7 th 2025	Background: Urinary tract infections is a common problem in Kirkuk province especially among children in pediatric hospital. Objective: The objective of this study was to clarify the distribution of urinary tract infections among children in Kirkuk pediatric hospital. Methods: A cross sectional study was conducted on 135 children with UTI, attended Kirkuk pediatric hospital during period from beginning of February to end of July 2025. The age of UTI children was ranging from below one year to 14 years. General urine examination was performed for each child and urine culture done for infected child. Results: The study showed that a total of 135 UTI children aged below one year to 14 years. The percentage of female 73(52.94) was higher than males 62(45.92%). In bacterial culture 36 out of 135 were positive (26.66%). The bacterial isolates included E.coli, staphylococcus aureus, Pseudomonas aeruginosa, Klebsiella pneumonia and Proteus vulgaris. The most common organism isolated was Escherichia coli (41.66%) among children below one year old. Conclusion: Escherichia coli was the most common bacteria causing UTI in children. The highest rate of infection was among children below one year.

Keywords: UTI, pediatric hospital, Bacteria, Kirkuk.

INTRODUCTION:

Normal urine is sterile liquid by-product of the body excreted through urethra via urination. The urine contents are indication of the physiological or pathological state of human body. Normally the urine is sterile and contains no organisms, it is a mixture of water and chemicals such as proteins or electrolytes.

Urinary tract infections are common infections caused by bacteria, it may be restricted to the bladder or it may affect kidney it may cause severe damage in urinary tract. The urinary tract infection in pediatrics may be associated with kidney scars and probably be congenital if untreated (1).

Urinary tract infections (UTIs) in children are common concern in Kirkuk. The infection affect boys and girls. It is known that UTI are very common among girls than boys it is estimated that nearly that (8.4%) of girls and (1.7%) of boys are effected with urinary tract infections, with highest ra0te was among below one year (2). It is shown that the infection affects girls and boys equally at 12 month of age or less but after that the rate in girls is greater than boys (3). In children UTIs is a main health problem, it is the third main cause of fever in children after respiratory and gastrointestinal diseases (4).

The most common cause of urinary tract infections are due to bacterial infections (1 Daniel) which affect about 7.8% of children below 19 years with clinical symptoms (5). The distribution of infection in children varies by age, sex, and circumcision (6). In first year of life the rate of infection in boys is greater than girl, while after that the infection become higher in girls than boys (7).

Urinary tract infections are widely distributed worldwide. The main clinical symptoms of disease are dysuria, frequency, suprapubic pain, fever. Its laboratory diagnosis based on urine analysis and urine culture (8). It is shown that dip are useful for screening of urinary tract infections, in addition to that urine culture is required for confirmation of diagnosis (9).

In Diyala (10) carried on a study on 150 urine samples to evaluate urine dipstick for leucocyte esterase test for diagnosis of urinary tract infection, to show the sensitivity, specificity, positive and negative predictive values of dipstick for leucocyte esterase test, she reported their rate were 86.5%, 87.5%, 97.3% and 55.25% respectively. She concluded that general examination and dipstick for leucocyte esterase methods are rapid test and could be substitution to urine culture to decrease the work load and also a good screening method.



In Baghdad a study carried out in Al-Mansour Pediatric teaching hospital and Childs central teaching hospital on 62 children patients aging 1-12 years of both genders, on bacterial culture on urine of children to isolate the causative agents of UTI. They found 54.55% of them were *E. coli*, followed by 22.73% *Pseudomonas aeruginosa*, 9.09% *Klebsiella pneumonia*, 9.09% *Proteus mirabilis* and 4.55% *Morganella morganii* (11).

Concerning the causative agents of microorganisms causing urinary tract infections, it is shown that *Escherichia coli* is the more frequently cause of urinary tract infections followed by *Klebsiella* species, *Proteus mirabilis*, *Pseudomonas aeruginosa* and *Enterobacter* species, *Staphylococci*. Fungus infections are detected in infants and children who are on antibiotics for long period (2), (12),(13). In febrile children in Central Teaching Hospital of pediatric in Baghdad, the highest bacterial infection was *E. coli*, followed by *Klebsiella pneumonia* (14).

In a study carried on school age children in Baghdad aging 6-12 years old, to show the prevalence of urinary tract infection and its related factors, determined that the rate of positive urine culture was 14.7%, among them 1.6% of children without clinical symptoms, the rate of *E. coli* among children was 65.9% with significant predisposing behaviors, such as holding back urine, wearing tight cloths and carbonated beverage intake (15). In a retrospective study carried on over a 4-year period in a primary neonatal children's hospital Baghdad and private clinics, to show the frequency of urinary tract infections, identification of causative agents in addition to antibiotic sensitivity of neonates. They found that UTIs in neonates is predominantly caused by *E. coli*, females and neonates aging 8-28 days are highly susceptible (16).

In Basrah, a study was performed in children to identify bacteria causing urinary tract infection among various patients according to age, gender and another socioeconomic status. It was found the majority of children were feverish, others had dysuria, flank pain. They found that the gram-negative bacteria were more common than gram positive ones, with *E. coli* was highest followed by *Klebsiella* and *Pseudomonas* respectively. The incidence of infections in females were higher than males (17).

In Kirkuk City (18) carried on a study on 105 urine samples from children, aging from 4 days to 10 years old from Kirkuk pediatric hospital and Kirkuk General Hospital to detect some types of bacteria causing urinary tract infections. The bacteria isolated among them were *Escherichia coli*, *Klebsiella pneumonia*, *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Staphylococcus epidermidis*. They found the rate of infections in females was greater than males, and in younger age group more than older groups.

In Erbil City, (13) studied the prevalence of UTIS among children with clinical features of urinary tract infections, found the rate of infections in females greater than In males (53.2 females%, 30.2% males).

Aim of study: The aim of this study is to show the frequency of urinary tract infections among children in Kirkuk Pediatric Hospital.

Patients and Methods:

Setting of the study: This study was performed in Pediatric Hospital, Kirkuk-Iraq.

Hundred and thirty five urine samples from patients with urinary tract infections were collected during the period from beginning of February to end of July 2025. Urine samples were collected from mid-stream urine under sterile condition, using sterile wide mouth screw cap container for general urine examination and culture.

Inclusion criteria:

Pediatric children from below one year to 14 years old in Kirkuk Pediatric hospital.

Exclusion criteria: children 15 years old, children with congenital anomalies.

Urine examination: Macroscopic examination of the urine was performed, which included assessing its colour, acidity, specific gravity, presence of albumin and for 24 hours sugar level. The urine samples then centrifuged at speed 3000 revolution per minute for 15 minutes. A drop of sediment was take and put on a glass slide, covered with cover slip and t

Urine culture: Urine samples for culture, immediately 0.02 µl inoculated on blood agar and MacConkey agar plate. The plates were incubated at 37° C. Bacterial identification was done according to standard bacteriological criteria.

Ethical approval:

The study conforms to the ethical norm and standards in the declaration of Helsinki. The ethical approval to complete the research was approved from Directory of Health, Kirkuk, and the University of Imam Jafar Al-Sadiq, Kirkuk branch, Kirkuk-Iraq. The authors declare no conflict of interest. **Financial disclosure:** The authors declared that this study has received no financial support. All authors declare that all participated in the design and analysis of the paper.

Statistical analysis:

The data were analyzed using SPSS, version 12. The data were expressed as percentages and frequencies, The student t-test and chi-squared were used and P-value of ≤ 0.05 was considered significant.

Results:



The study included 135 males and females, their age was ranging from below one year to 14 years. The frequency of UTI in females and males were 73(54.07%) and 62(45.92%) respectively (Table 1).

Table (1). Frequency of UTI children according to gender.

Gender	Number	Percentage %
Males	62	45.92
Females	73	52.94
Total	135	100

Rate of males

In this study the age of children with UTI in Kirkuk Pediatric hospital ranged between below one year to 14 years. Table 2 shows the rate of females 73(54.07%) was greater than males 62 (45.92%). The highest rate of UTI was among 6-10 years old which constitutes (39.49%), followed by 1-5 years (33.13%), over 10 (16.80%), the lowest rate was among below one year old (10.08%).

Table (2). Frequency of UTI among males and females children according to gender and age group.

Age group (years)	Males	Females	Total	%
Below one	10	3	13	9.629
1-5	23	32	55	40.740
6-10	21	26	47	34.814
Over 10-14	8	12	20	14.814
Total	62	73	135	

P<0.05

Table (3) shows out of 36 positive specimens gram negative pathogenic bacteria (Escherichia coli, Pseudomonas aeruginosa, Klebsiella pneumonia and Proteus vulgaris) 28(77.77%) are more than gram positive (Staphylococcus aureus) 8(22.22%).

Table (3). Distribution of isolated bacteria among UTI children.

Bacteria	Positive UTI cases	Percentage %
Escherichia coli	15	41.66
Staphylococcus aureus	8	22.22
Pseudomonas aeruginosa	5	13.88
Klebsiella pneumonia	5	13.88
Proteus vulgaris	3	8.33
Total	36	100

Table 4, shows out of 36 positive specimens with gram negative bacteria (Escherichia coli, Pseudomonas aeruginosa, Klebsiella pneumonia and proteus vulgaris) was 28(77.77%) were more than gram positive (Staphylococcus aureus) 8(22.22%).

Table (4) Types of bacteria isolated from children with UTI.

Urine culture	children with UTI	
	Number	Percentage
Gram positive	8	22.22%
Gram negativel	28	77.77%
Total	36	100

Table (5), shows the highest rate of bacterial growth was among children with UTI below one year 15(41.66%), followed by 1-5 year, 10(27.77%), 6-10 year 6(16.66%), and above 10 years 5(13.88%) respectively. The number of positive urine culture in females was higher than males.

Table (5). Frequency of positive urine culture among UTI children according to age and gender.



Positive urine culture cases with UTI in children according to age and gender.

Age group (year)	Number			Positive % out of 36	Positive % out of 135
	Female	Male	Total		
Below one	10	5	15	41.66	11.11
1-5	5	5	10	27.77	7.40
6-10	4	2	6	16.66	4.44
Above 10	3	2	5	13.88	3.70
Total	22	14	36	100	

On general urine examination of 135 urine specimens only 4 samples showed live bacteria, while high number of pus cells and red blood cells were seen. In addition to that albumin, sugar, bile, ketone bodies, epithelial cells, mucous, both granular and WBC casts were detected in urine. Regarding crystals the most predominant type was amorphous urate followed by uric acid, while calcium oxalate was seen in one specimen only (Table 6)..

Table (6). Frequency of UTI children according to urine analysis.

Urine analysis	Infected children number
Live bacteria	4
Pus cells	34
R.B.C	28
Albumin	1
Sugar	9
Bile	1
Ketone bodies	6
Epithelial cells	23
Mucous	52
Casts:	
Granular	5
WBC	1
Amorphous urate	70
Calcium oxalate	1
Uric acid	34

DISCUSSION:

In the present study the frequency of urinary tract infection among pediatric hospital in females was 73% while in males 62%, with rate of infection was higher among young age groups. The most common bacterial infection was Escherichia coli, followed by Staphylococcus aureus, Pseudomonas aeroginosa, Klebsiella pneumonia and proteus vulgaris. The second cause of UTI in this study was Staphylococcus aureus is in accordance with study in Erbil (13).



Several studies reported that the second common cause of UTI is Klebsiella pneumonia as in Turkey (19) and Aberystwyth, UK (20).

Urinary tract infection in pediatric is the main source of morbidity among children below 5 years of age . Regarding the demographic distribution, it is shown that the rate of infection in females was greater than males with high frequency of UTI was among 6-10 years old. This might be due improper use of toilet and unclean state of sanitary environment in the house and also due to careless habit of the family (21). The high rate of gram negative bacteria (77.77%) than gram positive one (22.22%) might be due continuous use of antibiotics without consulting urologist which lead to strain bacterial resistance inspite of using new generation antibiotics (22).

The greatest rate of E. coli accounted in this study (41.66%) is also approved by (11), (23), and by other studies causing UTI (13) and attributed to cause high frequency of this bacteria being one of the natural organism in human gut, which often endogenous with either Klebsiella (24) followed by incidence of Proteus mirabilis 7.5% and Staphylococcus aureus 15%. The highest rate of E. coli in children is also reported by (16) and the study of (14), showed that the frequency of E. coli was 54.9% among urinary tract infection of febrile children followed by Klebsiella pneumonia.

The higher rate of gram negative (-ve) organisms than gram positive (+) ones also reported by (17) who showed that gram negative bacteria were more common than gram positive ones and also found E. coli was highest followed by Klebsiella, proteus,

In Kirkuk, (18), carried out a study in pediatric hospital and Kirkuk General hospitals isolated E. coli, Klebsiella, Proteus, Pseudomonas aeruginosa, Staph aureus and Staph epidermidis. The high rate of E. coli among UTI all over the world may be due to several virulence factors such as adhesion, toxins and iron acquisition (25).

The high frequency of UTI in females than males attributed to anatomical difference between gender and the short length of urethra in females than males which make it more susceptible to bacterial entrance lead to UTI (21) and (26). The higher rate of infection in females than males is also reported by (27), in Erbil City and (17)in Kirkuk.

The highest rate of positive culture was among children below one year is in agreement with study of Saeed et al, in Erbil who found the frequency of UTI in pediatric hospital was 43.3%. The high incidence of UTI among children aging 1-10 years might be due to poor perianal hygiene and lack of management to clean their perineum (13).

On the basis of urine analysis test in laboratory unit in Kirkuk Pediatric hospital, it was found higher pus and red blood corpuscles among 135 children the Pus cells were found among 34 children and RBC among 28 children, this finding is almost identical to other studies, Jameel et al (28) carried out a wider study on general urine examination, in Baghdad showed pus cells, red blood cells and bacteria. In addition to that the most common crystals type were seen in this study were amorphous urate and uric acid, while (28) registered amorphous urate, followed by uric acid and amorphous phosphate. The differences might be due to sample size, season and location of study. In this study no Candida and parasites were detected.

Throughing light on finding of this study with that reported in other countries, it seems that the causative agents are almost identical. In Saudi Arabia, a study carried out on individuals with positive urine culture, found that rate of bacteria were isolated from females 62.66% greater than males 37.34%. Similar to our finding, gram negative bacteria isolated in higher number than gram positive one. The frequency of organisms isolated in their study were E. coli 47.97%, Klebsiella pneumonia 24.58% and Pseudomonas aeruginosa 11.55% (29). In Addis Ababa, a study on children under five years, found out of 130, 40 were culture positive, reported the highest rate organism was E. coli 60%, followed by Klebsiella pneumonia 20%, Enterobacter spp. 12.5% and Staphylococci spp. 7.5% (30). In Turkey, a study was performed to evaluate bacterial infection, among UTI in children, isolated E. coli in 61.2% children, followed by Klebsiella pneumonia 13.3%, proteus mirabilis 9.1%, and Enterococcus faecalis 3.5%. Concerning the gender differences , found E. coli more frequently isolated in females 71.7% than males 18.5% (31). In Iran, (32), studied the prevalence of UTI among infants with prolonged jaundice, showed the overall prevalence was 11% and E. coli was the main etiology of UTI .

Conclusion: The frequency of urinary tract infection in females was higher than males among children in Kirkuk pediatric hospital. E. coli was more common organism causing UTI in children.

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