

Prevalence of Urinary Tract Infection in Children from One to Fifteen Years Old in Basra City in 2014

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Abstract

A descriptive cross-sectional study carried out in Basra city to assess the prevalence of urinary tract infection depending on the result of urine culture in the central five hospitals (Al Basra Maternity and Pediatrics Hospital, Al Basra General Hospital, Al Mawanaa Hospital, Al Faihaa Hospital and Al Shifaa Hospital) that was done to the attendance of pediatrics outpatient clinic and their age range from one year to fifteen years. From total 38841 patient recorded as an attendance to the pediatrics outpatient clinic in the year 2014, urine culture was done for 824 patient of them and it was positive in 321 (39%) and negative in 503 (61%). From the 321 patients with positive urinary culture 142 patients (44.33%) were male and 179 patient (55.67%) were female with significant association between the result of urinary culture and sex ($p=0.042$). Patients with positive urine culture were divided into three age group and the result was that 84 patients (26.16%) were in the first age group (1-5 years), 151 patients (47%) in the second age group (6-10 years) and 86 patients (26.8%) in the third age group (11-15 years). Five type of bacteria were found in the result of patients with positive urine culture, the most common type of bacteria was (*Escherichia Coli*) (73.83%), followed by *Staphylococcus aureus* (17.13%), *Klebsiella pneumonia* (4.36%), and *Pseudomonas aeruginosa* (0.64%). The prevalence of urinary tract infections in Basra city at years 2014 was (8.26/1000 children attending outpatient clinics in Basra city hospitals). The Prevalence of urinary tract infection in the five major hospitals in Basra in 2014 was calculated and the result was that the prevalence of urinary tract infection was highest in Al Basra Maternity & Pediatrics Hospital (13.96) followed by Al Mawanaa Hospital (9.86), Al Faihaa Hospital (8.34) Al Basra General Hospital (7.44) and Al Shifaa Hospital (3.18). Then the Prevalence of urinary tract infection in Basra city for every month in 2014 was calculated to compare the prevalence for each month and the result was that there was high prevalence in March (10.17), April (13.72), July (11.58) August (10.11) comparing with the other months. This study conclude that in Basra city the urinary tract infection is more common in female than in male and mostly in age group from (6-10) years, and that (*Escherichia Coli*) is the most common type of the causative microorganisms, high prevalence of urinary tract infection was found in Al Basra Maternity and Pediatrics Hospital, the prevalence increase mainly in March, April, July, August.

1. Introduction

1.1 Urinary tract infection

Urinary tract infection is the most common serious bacterial infection causing illness in infants and children, It is one of the most common bacterial infections encountered by clinicians in developing countries.⁽¹⁾

Urinary tract infection is consider when urine culture shows greater than 100,000 colonies of a single pathogen, or if there are 10,000 colonies and the child is symptomatic.⁽²⁾ It is very necessary to identify children with UTI and treat them as soon as possible to avoid any long term complications and to reduce the risk of any significant morbidity because unrecognized UTI may progress into renal damage, hypertension and end stage renal disease.⁽³⁾ Any growth of typical urinary pathogens is considered clinically important if obtained by suprapubic aspiration. Children have a wide variety of clinical presentation, ranging from the asymptomatic presence of bacteria in the urine to potentially life-threatening infection of the kidney. A clinician's main goals are early diagnosis, appropriate antimicrobial therapy, identification of anatomic anomalies, and preservation of renal function. Treatment should be based on urine culture. Children noted to have renal scarring after an acute episode of UTI should be followed long-term for signs of hypertension and renal insufficiency.⁽⁴⁾

1.2 Epimiology

Urinary tract infections (UTIs) occur in 3-5% of girls and 1% of boys. In girls, the first UTI usually occurs by the age of 5 years, with peaks during infancy and toilet training. After the first UTI, 60-80% of girls will develop a second UTI within 18 month. In boys, most UTIs occur during the 1st years of life; UTIs are much more common in uncircumcised boys. The prevalence of UTIs varies with age. During the 1st years of life, the male: female ratio is 2.8-5.4:1. Beyond 1-2 year, there is a striking female preponderance, with a male: female ratio of 1:10.⁽²⁾

The increased risk of a UTI in the uncircumcised male infant appears to be secondary to adherence of

Escherichiacoli to the unkeratinized squamousmucosal surface of the prepuce. The circumcised prepuce is much less likely to harbor these potential uropathogens.⁽⁵⁾

Escherichia coli are the most common gram-negative bacteria responsible for UTI ;At least 80% of the uncomplicated cystitis and pyelonephritis are due to *Escherichia coli* ⁽⁶⁾. Whereas *Proteus mirabilis* and *Klebsiella pneumonia* infections accounts 10%, 6% respectively.⁽⁷⁾

Klebsiella spp. and *Enterobacterspp.*Infections are more common among children with recurrent UTIs(Recurrent urinary tract infection is defined as a single further infection by a new organism) in those treated with antibiotic prophylaxis. Whereas other uropathogens like *Pseudomonas* and *Candida* are more common among children with urogenital abnormalities.⁽⁸⁾

However, some studies on white females suggest that there may be genetic tendencies for UTI, such as lack of secretion of carbohydrates that protect against bacterial adherence in the urinary tract.⁽⁹⁾

1.3 Etiology

UTIs are caused mainly by colonic bacteria. In females, 75-90% of all infections are caused by *Escherichia coli*, followed by *Klebsiella* and *Proteus*. Some series report that in males older than 1 yr of age, *Proteus* is as common as *E. coli*; others report a preponderance of gram-positive organisms in males. *Staphylococcus saprophyticus* is a pathogen in both sexes. Viral infections, particularly adenovirus, may also occur, especially as a cause of cystitis.⁽¹⁰⁾

UTIs have been considered an important risk factor for the development of renal insufficiency or end-stage renal disease. Some have questioned the importance of UTI as a risk factor because only 2% of children with current renal insufficiency report a history of UTI. This paradox is probably secondary to better recognition of the risks of UTI and prompt diagnosis and therapy.⁽¹¹⁾

The normal urinary tract is sterile. Contamination by bowel flora may result in urinary infection if a virulent microorganism is involved in immunosuppressed child. In neonates, infection may originate from other sources like *Escherichia coli*.⁽¹²⁾

1.5. Diagnosis of UTI

UTI is defined by a combination of clinical features and the presence of bacteria in urine. It is also defined by the presence of more than 100000 colony-forming units (cfu) of single bacteria in cultured urine. The clinical features of UTI may include both specific and nonspecific signs and symptoms. Accurate diagnosis and treatment of UTI is essential to limit it-associated morbidity, mortality and to avoid prolonged or unnecessary use of antibiotics.⁽⁶⁾ Diagnosis of UTI is difficult particularly in young children and infants. Because in this age group, the clinical presentation of urine infection is often with non-specific clinical signs such as fever, irritability, and vomiting that are also commonly seen in other childhood viral illnesses, evaluation of UTI relies on both lab investigations and clinical signs and symptoms. Laboratory investigations include both urinalysis and urine culture.⁽¹³⁾

A UTI may be suspected based on the symptoms or findings on urinalysis, or both, but a urine culture is necessary for confirmation and appropriate therapy. Thus, the diagnosis of UTI depends on having the proper sample of urine. There are several ways to obtain a urine sample; some are more accurate than others. In toilet-trained children, a midstream urine sample is usually satisfactory. Most studies have failed to show any benefit to formally cleaning the introitus before obtaining the specimen. If the culture shows greater than 100,000 colonies of a single pathogen, or if there are 10,000 colonies and the child is symptomatic, it is considered a UTI. In uncircumcised males, the prepuce must be retracted; if the prepuce is not retractable, this method of urine collection is unreliable.⁽¹⁴⁾ When greater assurance as to the possibility of infection is needed, a catheterized specimen must be obtained. Proper skin preparation and good technique of catheterization are important. The use of a Number 5 French polyethylene feeding tube in infants or a Number 8 French tube with proper lubrication in older children minimizes the chance of urethral trauma and contamination. Only a few milliliters need to be aspirated with a syringe to obtain the urine sample. Catheterization shortly after spontaneous voiding produces a measure of the residual urine in the bladder and helps assess problems related to bladder emptying.⁽¹⁵⁾ Prompt plating of the urine sample is important because if the urine sits at room temperature for more than 60 min, overgrowth of a minor contaminant may suggest a UTI, when in fact the urine may not be infected. Placing the sample in a refrigerator is a reliable method of storing the urine until it can be cultured.⁽¹⁶⁾

1.5.1 Urinalysis

Dipstick screening test and microscopy are the components of urinalysis, and they are very useful in the evaluation and rapid screening of UTI, microscopic examination of the urine for the presence of WBCs and bacteria is usually performed after centrifugation. More than three WBCs per high-power field suggest a possible infection.⁽⁶⁾

Elevation in number of WBCs in urine is a result of an inflammatory response of urogenital mucosa to colonizing bacteria.⁽¹⁷⁾ Examination of uncentrifuged urine sample is considered to be more sensitive and specific and is called enhanced urinalysis.⁽¹⁸⁾

1.5.2 Urine culture

Urine culture is usually done to confirm a positive dipstick test result to identify the causative organism of UTI,

and to make an accurate decision about the best treatment for UTI.⁽¹⁹⁾

Urine samples should be sent to culture for the following :⁽²⁾

- 1- infants and children who have a diagnosis of acute pyelonephritis.
- 2- in infants and children with high risk to serious illness.
- 3- in infants and children under 3 years.
- 4- in infants and children with a single positive result of leukocyte esterase or nitrite.
- 5- in infants and children with recurrent UTI.

1.5.3. Collection of urine

Prevention of contamination by normal vaginal perianal or anterior urethral flora is the important consideration for collection of clinically relevant urine specimen.⁽²⁰⁾

There are four types of urine collection⁽²⁰⁾

- 1- Clean –catch midstream urine.
- 2- Indwelling catheter (Foley).
- 3- Supra pubic aspiration
- 4- Urine bag.

1.5.4. Specimen transport

Urine collected in sterile container must be processed at the earliest time preferably within 2 hours, if it is not possible refrigerate the sample at 4⁰c and processed within 24 hours.⁽²⁰⁾

1.5.5. Culture media

- 1- blood agar
- 2- macConkey agar
- 3- cystine –lactose electrolyte deficient (CLED) agar.⁽²⁰⁾

1.6. objectives of the study

- 1- Assess the prevalence of urinary tract infection in children from one year up to fifteen year in the five central hospitals in AL Basra city in 2014.
- 2- Discuss the most common causative microorganism responsible for urinary tract infection in Basra.
- 3- Calculate the prevalence of urinary tract infection in each of the five hospital separately and the prevalence in each month in 2014.

1.7. justifications of the study

Urinary tract infection is the most common serious bacterial infection causing illness in infants and children, It is very necessary to identify children with UTI and treat them as soon as possible to avoid any long-term complications and to reduce the risk of any significant morbidity. So this study aimed to show the prevalence of urinary tract infection in Basra and draw attention for this serious disease.

ABBREVIATIONS.

UTI: urinary tract infections, cfu :colony-forming units, ED: emergency department ,URI: upper respiratory infection ,CI: confidence interval

WBC: white blood cell, GI: gastrointestinal

2. Subjects and Method

2.1 Study design

A descriptive cross-sectional study was designed to assess the prevalence of urinary tract infections in Basra city in 2014. The study involved the attendance of the pediatrics outpatient clinic in five central hospitals in Basra city, age from 1-15 years.

2.2 Study population

The attendance of the pediatrics outpatient clinic in five major hospitals in Basra city in 2014, age 1-15 years.

The following hospitals were involved in the study for the purpose of data collection:

- 1- Al Basra maternity and pediatrics hospital
- 2- Al Basra general hospital
- 3- Al- Mawanaa general hospital
- 4- Alfayhaa general hospital
- 5- Alshifaa general hospital

2.3 The Study Sample : the children who attend the pediatrics outpatient clinic in 2014 and aged from one year to fifteen years in the five mentioned hospitals, where the urine culture was done for them. The results of urine cultures was taken from the laboratory department in each hospital for that year (month by month). Total number of children aged from one year to fifteen years who visited the pediatrics outpatient clinics in 2014 also recorded from each hospital and it was 38841 patients, urine culture was done for 824 patient of them, it was positive in 321 patient and negative in 503 patient.

2.4 Data Collection: The laboratories in the five hospitals where visited and the urine culture registration is maintained. Available data on every urine sample were checked and all cases for which positive or negative

urine culture was written and relevant data compiled (the types of microorganism, age and sex). In addition, the investigator visited the outpatient clinic in each hospital to register the total numbers of the children who attend the pediatrics outpatients for each month in each hospital for that year (2014).

2.5 Exclusion criteria: 1- Age below one year and more than 15 years. 2- Contaminated urine culture.

2.6 Tools of Study: Especial questionnaire prepared for the purpose of the study to record the information for each patient involve in the study.

The questionnaire consisted of the following aspects:

1. Gender
2. Age
3. Data of urine culture
4. Result of urine culture
5. Type of causative microorganism
6. Hospital name

2.7 The Studied Variables

1-Age: 1- 15 years

2-Gender: males and females.

3-Urine culture: positive or negative urine culture.

Urinary tract infection is positive when urine culture shows greater than 100,000 colonies of a single pathogen, or if there are 10,000 colonies and the child is symptomatic, while it consider negative if it shows no growth in 24 -48 hour or less than 10000 cfu/ml.⁽²⁾

4-Types of microorganism taken from laboratory records in the mentioned hospitals.

2.8 Statistical Analysis

The Statistical Package for Social Science (SPSS), Version 16 was utilized for the purpose of statistical analysis of the data.

Prevalence rate was calculated by this equation:

$$PR = \frac{\text{Number of existing cases during 2014}}{\text{Total population at risk in the same place and year}} \times 1000$$

3. RESULT

(3-1) Distribution of children by sex and urine cultures results .

This table shows the distribution of total children whether having positive or negative urine culture according to sex, of total 824 children 48.3% were male and 51.7% were female, culture was positive in 17.2% of male and 21.7% in female

(3-1) Distribution of children by sex and urine cultures results .

Sex	Positive culture	Negative culture	Total
Male	142	256	398
%	17.2	31.1	48.3
Female	179	247	462
%	21.7	30	51.7
Total	321	503	824
%	39	61	100

3.2 Distribution of children by age and urine culture results

This table shows that majority of the children 18.3% were in the second age group (5 - 10) years, 10.2 % were in the first age group and 10.4 % were in the third age group for the positive culture results .

Table (3-2) Distribution of children by age and urine culture results

Age group(years)	Positive culture	Negative culture	Total
1-5	84	121	205
%	10.2	14.7	24.9
6-10	151	240	391
%	18.3	29.1	47.5
11-15	86	142	228
%	10.4	17.2	27.7
Total	321	503	824
%	39	61	100

(3-3) Distribution of children with positive urine culture in according to the type of bacteria.

This table shows distribution of children in to five groups depending on the result of urine culture, most cases (73.83%) caused by *Escherichia Coli*, followed by (17.13%) by *Staphylococcus*, (4.36%) by *Klebsiella pneumonia*, (4.04%) by *proteus mirabilis* and (0.64%) caused by *pseudomonas aeruginosa*.

Table (3-3) Distribution of cases with positive urine culture according to the type of bacteria.

Results of urine culture	Number of cases	Percentages
<i>Escherichia Coli</i>	237	73.83
<i>Staphylococcus aureus</i>	55	17.13
<i>Klebsiella pneumon</i>	14	4.36
<i>Proteus mirabilis</i>	13	4.4
<i>Pseudomonas aeruginosa</i>	2	0.64
Total	321	100

(3.4)Prevalence of urinary tract infection in the five central hospitals in Basra 2014.

This table shows the prevalence of urinary tract infection in the five central hospitals in Basra, the highest prevalence was in Al Basra maternity and pediatrics hospital, (prevalence =10.38).

(3.4)Prevalence of urinary tract infection in the five central hospitals in Basra 2014.

Hospital	Positive culture	Negative culture	Total attendance/ year	Prevalence
AL Basra Maternity&Ped.H.	92	236	8856	10.38
%	11.2	28.6		
AlBasra generalH.	57	70	7652	7.44
%	6.9	8.5		
AL Mawanaa H	75	85	7601	9.86
%	9.1	10.3		
AL Fehaee H.	81	78	9707	8.34
%	9.8	9.5		
AL Shifaa H.	16	34	5025	3.18
%	1.9	4.1		

Table(3.5)Prevalence of urinary tract infection in Basra for each month in 2014.

The Prevalence of urinary tract infection in the five major hospitals in Basrain 2014 was calculated and the result was that the of urinary tract infection was high in Al Basra Maternity&Pediatrics Hospital (13.96) followed by Al Mawanaa Hospital(9.86), AlFehaee Hospital (8.34) AlBasraGeneralHospital (7.44) and AlShifaa Hospital(3.18).

Table(3.5)Prevalence of urinary tract infection in Basra for each month in 2014.

Month	Positive culture	Negative culture	Total attendance /month	Prevalence
Jan. %	23 2.8	33 4	2950	7.79
Feb. %	23 2.8	56 6.8	3115	7.38
March %	29 3.5	55 6.7	2850	10.17
April %	41 5	57 6.9	2987	13.72
May %	34 4.1	42 5.1	3202	10.61
June %	23 2.8	48 5.8	3350	6.86
July %	36 4.4	46 5.6	3108	11.58
August %	34 4.1	41 5	3360	10.11
Sept %	22 2.7	26 3.2	3342	6.58
Oct. %	24 2.9	39 4.7	3075	7.8
Nov. %	13 1.6	27 3.3	3989	3.25
Dec. %	19 2.3	33 4	3513	5.4
Total %	321 39	503 61	38841	8.26

4.1 Discussion

The total number of the pediatrics outpatient clinic attendance in 2014 was (38841)patients , urine culture done for (824)patients, it was negative in (503) patients and positive in (321) patients with prevalence equal to (8.26).In this study which was done in Basra city to assess the prevalence of urinary tract infection, total 38841 patients recorded as an attendance to the pediatrics outpatient clinic in 2014,there age range from (1-15) years ,urine culture was done for 824 patients of them, it was positive in 321 patients (39%) and negative in 503 patients (61%). the prevalence was 8.27 which is differ from Irbil study which found that 43.3% of the studied children was having UTI (24) , while an American (Philadelphia) study showed that the prevalence of UTI was 3.3 % which is lower than our result (23) , another American study by Stanford University School of Medicine showed that the prevalence was 2.4 % (36) A study on Prevalence of Urinary Tract Infection among Children in Nablus was 4% (21) Of the 321 case with positive urine culture 142patients (44.33%)were male and 179 patients (55.67%) were female with significant association between the result of urinary culture and sex (p=0.042).This result is similar to the result of another study done in Egypt.⁽³⁾ and a study done in Irbil study (24) Patients with positive urine culture were divided into three groups depending on their age, the result was that 84patients (26.16%) were in the first age group (1-5), 151patients (47%) in the second age group (5-10) and 86 patients (26.8%) in the third age group with no significant association (p=0.204).this result is similar to the result of another study done in Tunis.⁽⁷⁾ and Irbil study(24)Five type of bacteria were found in the result of patients with positive urine culture , most common type of bacteria was *Escherichia Coli* equal to (73.83 %), *Staphylococcus aureus*(17.13%), *Klebsiella pneumonia* (4.36%),*Proteus mirabilis* (4.04%) *Pseudomonas aeruginosa* (0.64%)this result is similar to the result of a study done in Egypt.⁽³⁾ *Escherichia Coli* also appear the commonest organism in Irbil study(24) Then the Prevalence of urinary tract infection in Basra for each month in 2014 was calculated and the highest result was in April (13.72).

5.1 Conclusions

1-Urinary tract infection is more common in female than in male in Basra and mainly in the age group between 5-10 year.

2-*Escherichiacoliis* the most common type of bacteria that found to be causative microorganism for urinary tract infection in Basra.

- 3-The prevalence of urinary tract infection is higher in AL Basra Maternity&PediatricsHospital than other hospital.
- 4- The prevalence of urinary tract infection in AL Basra city in 2014 was (8.26).

5.2 Recommendations

- 1- Doctors encourage asking their patient to do urine culture when they suspect UTI in order to give the suitable treatment.
- 2-A wide spread screening program for UTI should be done to detect the exact prevalence of UTI in other area and to avoid farther complication of this treatable infection.
- 3-More health promotion program are needed to be done at school to increase awareness of student to improve their healthy behaviors.
- 4-Encouragement and health education to avoid the risk factor that increase the occurrence of UTI.

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