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PREVALENCE OF URINARY TRACT INFECTION IN FEBRILE CHILDREN WITHOUT A FOCUS OF INFECTION AND DIAGNOSTIC IMPORTANCE OF URINALYSIS

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ABSTRACT

Background: Urinary tract infections of children are public health problems need wide efforts in screening and diagnosis. Urine culture is the definite diagnostic method to assess urinary tract infections. **Aim of study:** To determine the prevalence of UTI in preschool and school age febrile children at age of 3 to 12 years old and the importance of urinalysis in screening and diagnosis of UTI. **Patients and methods:** A descriptive cross sectional study conducted in emergency unit and pediatric Consultancy clinic of AL-Imamein AL-Kadhimaein Medical City in Baghdad city during the period from 1st of September, 2018 to 31st of August, 2019. A sample of 100 febrile children (temperature ≥ 38°C) age range (3-12) years Evaluation for urinary tract infection was done depending on microscopic urinalysis, dipstick analysis and Urine culture. **Results:** Urine culture of febrile children was positive in 12child (12%) of them;9 children (75%) of those with positive urine culture had E-Coli microorganism and 3child (25%) of them had Non E-Coli (Proteus, Klebsilla and Enterococcus). Significant symptoms of urinary tract infection among preschool and school age febrile are convulsions, abdominal pain, refusal to feed and dysuria. WBC/HPF, bacteriuria, Dipstick Nitrite test, Dipstick Leukocyte esterase test, ESR and CRP are helpful for screening and diagnosis. **Conclusions:** The prevalence of urinary tract infection among preschool and school age febrile children is 12% and urinalysis is a valuable tool to screen and diagnose urinary tract infection.

KEYWORDS: Urinary tract infection, Children, Urine culture.

INTRODUCTION

Urinary tract infection (UTI) is a bacterial infection that can occur at any level of the urinary tract, including the bladder (cystitis), renal pelvis (pyelitis), or renal parenchyma (pyelonephritis). Infections of the urethra (urethritis) and reproductive tract (such as epididymitis and prostatitis) are much less common and are often associated with sexually transmitted diseases.[1] **Renal abscess** can develop as a complication of urinary tract infections, occurring either within the renal parenchyma (intrarenal) or around the kidney (perinephric).[2] UTI is a **common and significant clinical problem in childhood**. If left untreated, it can lead to serious complications such as **renal scarring, hypertension, and end-stage renal disease.**[3] Although fever is a frequent symptom in children with UTI, it can be challenging to distinguish UTI from other febrile illnesses, particularly in developing countries.[4] Consequently, UTI is often **underdiagnosed** in pediatric wards, leading to missed opportunities for timely intervention. Infections, whether symptomatic or asymptomatic, have greater clinical significance in childhood than in adulthood, as most renal scarring occurs following UTIs during the first five years of life.[5] UTIs may also serve as a sentinel event for underlying renal abnormalities, although most affected children have normal anatomy. Early diagnosis and prompt initiation of treatment are crucial in preventing long-term renal damage. However, the growing problem of antibiotic resistance may hinder timely and effective therapy.[6] A thorough understanding of UTI pathogenesis, risk factors, diagnostic criteria, and appropriate antimicrobial use is essential for optimal management of UTIs in children.[7] This study aims to determine the prevalence of UTI in febrile preschool and school-age children (aged 3 to 12 years) and assess the role of urinalysis in screening and diagnosing UTI.

METHOD

This descriptive cross-sectional study was conducted at AL-Imamein AL-Kadhimaein Medical City, Baghdad, from September 1, 2018, to August 31, 2019. A convenient sample of 100 febrile children (ages 3–12 years) presenting to the emergency unit and pediatric clinic was selected based on inclusion and exclusion criteria.

Inclusion Criteria

- Children aged 3–12 years with fever (≥38°C).
- Minor potential sources of fever (e.g., upper respiratory tract infection, gastroenteritis, viral rash).

Exclusion Criteria

- Immunosuppressed children, fever >14 days, antibiotic use.
- Congenital renal anomalies, renal disease, definitive fever sources (e.g., pneumonia, meningitis).
- Neurological disorders and specific viral infections (e.g., varicella, Kawasaki syndrome).
  Data Collection & Ethical Considerations

Data were collected using a structured questionnaire after obtaining oral parental consent. Information included sociodemographic data, clinical presentation, and investigations (ESR, CRP, urinalysis, and urine culture).

Urine Sample Collection & Analysis

- Toilet-trained children: Midstream urine samples collected under sterile conditions.
- Uncircumcised males: Prepuce retracted and glans cleaned before sample collection.
- Samples were processed immediately for urinalysis, dipstick analysis, and urine culture.

Laboratory Methods

- Microscopic urinalysis: Centrifuged urine examined for WBCs (>10 cells/HPF) and Gram staining.
- Dipstick analysis: Tested for nitrites and leukocyte esterase using DIRUI H11-MA strips.
- Urine culture: Cultured on blood agar and MacConkey agar, incubated at 35-37°C for 48 hours.
- Significant growth: ≥100,000 CFU/ml, or 10,000–50,000 CFU/ml of a single organism.

Statistical Analysis

Data were analyzed using SPSS version 23. Results were presented as means, standard deviations, and categorical variables. Chi-square and Fisher's exact tests were used for comparisons, with $p \leq 0.05$ considered statistically significant.

RESULTS

This study of 100 febrile children (mean age 6±2.6 years; 69% aged 3-6, 31% aged 7-12) showed equal gender distribution. Common diagnoses were upper respiratory tract infection (38%), gastroenteritis (30%), and unknown (32%). Symptoms included vomiting (35%), cough/cold (35%), abdominal pain (31%), and decreased oral intake (9%). Urine analysis revealed 12% positive cultures, predominantly E. Coli (75%). Antibiotic sensitivity was highest for Ceftriaxone and Cephotaxime (75%), with resistance highest for Ampicillin (58.3%) and Cortimaxozole (50%). As in table 1.

Table 1: distribution of patients according to study variables.

Variable	No.	%
Age (mean ± SD)	6±2.6 years	
3-6 years	69	69.0
>6-12 years	31	31.0
Gender (Male/Female)	50/50	50.0/50.0
Upper respiratory tract infection	38	38.0
Gastroenteritis	30	30.0
Unknown Diagnosis	32	32.0
Vomiting	35	35.0
Convulsions	8	8.0
Cough and Cold	35	35.0
Loose stool	30	30.0
Abdominal pain	31	31.0
Decreased Oral Intake	9	9.0
Increased Frequency	29	29.0
Dysuria	29	29.0
Urgency	4	4.0
Decreased Urine Output	13	13.0
Secondary Enuresis	2	2.0
Dribbling of Urine	10	10.0
Circumcision	37/50	74.0
WBC/HPF (≥10)	35	35.0
Bacteria (Positive)	15	15.0
Dipstick Nitrite Test (Positive)	20	20.0
Dipstick Leukocyte Esterase (Positive)	13	13.0

ESR (High)	18	18.0
CRP (Positive)	31	31.0
Urine Culture (Positive)	12	12.0
Urine Culture (Negative)	88	88.0
E. Coli	9	75.0
Non E. Coli (Proteus, Klebsiella, Enterococcus)	3	25.0
Ampicillin (Sensitive)	5	41.7
Ampicillin (Resistant)	7	58.3
Cotrimoxazole (Sensitive)	6	50.0
Cotrimoxazole (Resistant)	6	50.0
Gentamycin (Sensitive)	8	66.7
Gentamycin (Resistant)	4	33.3
Cephalexin (Sensitive)	8	66.7
Cephalexin (Resistant)	4	33.3
Ceftriaxone (Sensitive)	9	75.0
Ceftriaxone (Resistant)	3	25.0
Cefotaxime (Sensitive)	9	75.0
Cefotaxime (Resistant)	3	25.0
Ciprofloxacin (Sensitive)	8	66.7
Ciprofloxacin (Resistant)	4	33.3

No significant differences were observed between febrile children with positive urine culture and febrile children with negative urine culture regarding their age (p=0.8) and gender (p=0.5). (***Table 2***)

Table 2: Distribution of sociodemographic characteristics according to urine culture.

Variable	Urine culture				P-value
	Positive		Negative		
	No.	%	No.	%	
Age groups					0.8* ***Not significant***
3-6 years	8	66.7	61	69.3	
>6-12 years	4	33.3	27	30.7	
Gender					0.5** ***Not significant***
Male	5	41.7	45	51.1	
Female	7	58.3	43	48.9	

**Fishers exact test, **Chi-square test*.

No significant differences were observed between febrile children with positive urine culture and febrile children with negative urine culture regarding clinical diagnosis (p=0.8). (***Table 3***).

Table 3: Distribution of clinical diagnosis according to urine culture.

Variable	Urine culture				P- value
	Positive		Negative		
	No.	%	No.	%	
Clinical diagnosis					0.5** ***Not significant***
Upper respiratory tract infection	3	25.0	35	39.8	
Gastroenteritis	5	41.7	25	28.4	
Unknown	4	33.3	28	31.8	

**Fishers exact test*.

No significant differences were observed between febrile children with positive urine culture and febrile children with negative urine culture regarding vomiting (p=0.4), cough and cold (p=0.4) and loose stool (p=0.1). There was a significant association between febrile children with positive urine culture and convulsions (p=0.02). (***Table 4***).

Table 4: Distribution of clinical presentation according to urine culture.

Variable	Urine culture				P- value
	Positive		Negative		
	No.	%	No.	%	
Vomiting					0.4* ***Not significant***
Yes	3	25.0	32	36.4	
No	9	75.0	56	63.6	
Convulsions					**0.02*** ***Significant***
Yes	3	25.0	5	5.7	
No	9	75.0	83	94.3	
Cough and Cold					0.4* ***Not significant***
Yes	3	25.0	32	36.4	
No	9	75.0	56	63.6	
Loose stool					0.1* ***Not significant***
Yes	6	50.0	24	27.3	
No	6	75.0	64	72.7	

**Fishers exact test*.

No significant differences were observed between febrile children with positive urine culture and febrile children with negative urine culture regarding increase frequency (p=0.7) and urgency (p=0.4). There was a significant association between abdominal pain and positive urine culture of febrile children (p=0.004) and between Dysuria and positive urine culture of febrile children (p=0.01). A highly significant association was observed between decreased Oral intake and positive urine culture of febrile children (p<0.001). (***Table 5***).

Table 5: Distribution of clinical presentation according to urine culture.

Variable	Urine culture				P-value
	Positive		Negative		
	No.	%	No.	%	
Abdominal pain					**0.004*** ***Significant***
Yes	8	66.7	23	26.1	
No	4	33.3	65	73.9	
Decreased Oral intake					**<0.001**** ***Highly significant***
Yes	5	41.7	4	4.5	
No	7	58.3	84	95.5	
Increase Frequency					0.7* ***Not significant***
Yes	3	25.0	26	29.5	
No	9	75.0	62	70.5	
Dysuria					**0.01*** ***Significant***
Yes	7	58.3	22	25.0	
No	5	41.7	66	75.0	
Urgency					0.4* ***Not significant***
Yes	1	8.3	3	3.4	
No	11	91.7	85	96.6	

**Fishers exact test*.

No significant differences were observed between febrile children with positive urine culture and febrile children with negative urine culture regarding decrease UOP (p=0.1), secondary enuresis (p=0.09), dribbling of urine (p=0.8) and circumcision (p=0.4). (***Table 6***).

Table 6: Distribution of clinical presentation according to urine culture.

Variable	Urine culture				P- value
	Positive		Negative		
	No.	%	No.	%	
Decrease UOP					0.1* ***Not significant***
Yes	3	25.0	10	11.4	
No	9	75.0	78	88.6	
Secondary Enuresis					0.09* ***Not significant***
Yes	1	8.3	1	1.1	

No	11	91.7	87	98.9	
Dribbling of Urine					0.8* ***Not significant***
Yes	1	8.3	9	10.2	
No	11	91.7	79	89.8	
Circumcision					0.4* ***Not significant***
Yes	3	60.0	34	75.6	
No	2	40.0	11	24.4	

**Fishers exact test.*

A highly significant association was observed between increased WBC/HPF and positive urine culture of febrile children (p<0.001). There was a significant association between positive bacteria in urine and positive urine culture of febrile children (p=0.006). A highly significant association was observed between positive Dipstick Nitrite test and positive urine culture of febrile children (p<0.001). There was a highly significant association between positive Dipstick Leukocyte esterase test and positive urine culture of febrile children (p<0.001). Febrile children with high ESR and positive CRP were significantly associated with positive urine culture of febrile children. (***Table 7***).

Table 7: Distribution of investigations findings according to urine culture.

Variable	Urine culture				P- value
	Positive		Negative		
	No.	%	No.	%	
WBC/HPIF					**<0.001*** ***Highly significant***
<10	2	16.7	63	71.6	
≥10	10	83.3	25	28.4	
Bacteria					**0.006*** ***Significant***
Positive	5	41.7	10	11.4	
Negative	7	58.3	78	88.6	
Dipstick Nitrite test					**<0.001*** ***Highly significant***
Positive	9	75.0	11	12.5	
Negative	3	25.0	77	87.5	
Dipstick Leukocyte esterase					**<0.001*** ***Highly significant***
Positive	8	66.7	5	5.7	
Negative	4	33.3	83	94.3	
ESR					**0.002*** ***Significant***
Normal	6	50.0	76	86.4	
High	6	50.0	12	13.6	
CRP					**0.02*** ***Significant***
Positive	7	58.3	24	27.3	
Negative	5	41.7	64	72.7	

**Fishers exact test.*

DISCUSSION

Urinary tract infection (UTI) is the second most common bacterial infection in children, following respiratory tract infections, with nearly one-third experiencing recurrent UTIs within a year.[8] Symptoms vary between younger and older children.[9] In this study, the prevalence of UTI detected by urine culture among febrile preschool and school-age children was 12%. This is lower than the 43.3% prevalence reported by Saeed et al.[10] in Iraq, possibly due to differences in sample size, cultural factors, and study design. However, our findings are consistent with the 11.28% prevalence reported by Kazeminezhad et al.[11] in Iran. Compared to other studies, our prevalence is higher than Singh and Prihar's (6.36%) in Pakistan[12] but lower than Naik and Venkatesha's (14%) in India.[13] Although no significant differences were found regarding age and gender, UTI prevalence increased with age, aligning with Shaikh et al.[14] in the USA. Female predominance is well-documented[13,15], likely due to shorter urethras and bacterial translocation. UTI prevalence varies by age: 0.1–0.4% in infant girls, increasing to 1.4% (1–5 years) and 0.7–2.3% (school age).[16] Among males, circumcision reduces UTI prevalence (0.2% in circumcised vs. 0.7% in uncircumcised infants).[17] In our study, 13.1% of febrile 3–6-year-olds and 14.8% of febrile 7–12-year-olds had positive cultures, supporting findings from Conway et al. (6.2% UTI risk in children <6 years)[18] and Singh et al. (7.8% in older children with urinary symptoms).[19] Regarding causative organisms, E. coli was the most common (75%), with higher antibiotic sensitivity to ceftriaxone and cefotaxime, while ampicillin and cotrimoxazole showed high resistance, consistent with Saeed et al.[9] in Iraq and Abuhandan et al.[20] in Turkey. Differences in antibiotic resistance across studies may be due to variations in prescribing

practices and community antibiotic use. A significant association was found between febrile children with positive urine culture and convulsions (p=0.02), consistent with Mahyar et al.[21] in Iran, which linked UTI to febrile seizures. However, convulsions can also occur due to epilepsy, hypoglycemia, and electrolyte disturbances.[22] Significant associations were also found between UTI and abdominal pain (p=0.004), aligning with Ibeneme et al.[23] in Nigeria and Robinson et al.[24] in Canada. However, abdominal pain can have other causes, including gastrointestinal, cardiac, and metabolic disorders.[25] Decreased oral intake (p<0.001) was another key finding, corroborating Zorc et al.[26] in the USA and Bindu and Rai[27] in India. Dysuria (p=0.01) was also significantly associated with UTI, consistent with Copp and Schmidt[28] in the USA and Al-Rikabi and Abu-Raghif[29] in Iraq. Regarding laboratory findings, a highly significant association was observed between WBC/HPF and positive urine culture (p<0.001), aligning with Ashoka et al.[30] in India, which found pyuria >10 WBC/HPF to be predictive of UTI. Bacteriuria (p=0.006) was also significantly associated with positive urine culture, as reported by Tsai et al.[31] in Taiwan. Among dipstick tests, positive nitrite (p<0.001) and leukocyte esterase (p<0.001) tests were significantly associated with UTI, aligning with Glissmeyer et al.[32] and Tzimenatos et al.[33] in the USA. Furthermore, elevated ESR and CRP were significantly linked to UTI, similar to findings by Ayazi et al.[[34] in Iran, which suggested that acute-phase reactants assist in UTI diagnosis but are not definitive.

CONCLUSION

The prevalence of urinary tract infection (UTI) among febrile children increases with age and is more common in females. Common symptoms include convulsions, abdominal pain, decreased oral intake, and dysuria. E. coli is the most frequent bacterial cause, followed by non-E. coli species like Proteus and Klebsiella. Antibiotic sensitivity is highest for Ceftriaxone and Cephotaxime, with resistance observed for Ampicillin and Cortimaxozole. Key diagnostic tools include WBC/HPF, bacteriuria, Dipstick Nitrite, Leukocyte esterase tests, ESR, and CRP.

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