

Original Article

Frequency of Common Causative Organisms of Urinary Tract Infection in Children with Acute Febrile Illness

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Abstract

Objective: To determine the frequency of common causative organisms of urinary tract infection in children with acute febrile illness.

Methods: This descriptive cross sectional study was conducted at Pathology department, King Edward Medical University, Lahore from 15th July 2019 to 15th January 2020. After ethical approval, 200 patients from 3 months to 12 years of age with either gender with acute febrile illness and urinary tract infection were included. Patients with history of urinary fungal infections (Candida) & urinary tract stones, or prior antibiotics therapy were excluded. Demographic details were noted in a pre-designed proforma. A sterile technique was used to collect mid-stream urine sample. Then it was properly labeled & sent to the college pathology laboratory for culture. Urine culture was repeated if more than one organism discovered. Data for causative organism was noted on predesigned proforma. Data was analyzed by using SPSS-22.

Results: Mean age of the patients was 5.830±2.83 years, mean duration of febrile illness was 23.205±7.46 hours and mean weight was 20.675±7.27 Kg. There were 73.5% males and 26.5% females. E.coli was present in 70% patients, Enterobacter 15% and Klebsiella was seen in 11% of the children.

Conclusion: Escherichia coli was the most common causative organism responsible for UTI in children of age 3 months to 12 years followed by Enterobacter and Klebsiella.

Key Words: Urinary Tract Infection, Acute Febrile Illness, Causative Organism, Frequency, Children

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Introduction

Urinary tract infection (UTI) is the common cause of acute febrile illness in children.¹ It is commonly caused by bacteria.² There is 3%–7% incidence of UTI in girls as compared to 1 to 2% in boys.³ As per World Health Organization (WHO) it is found in 24.5% children of Pakistan.⁴ UTI is not generally reported at first level health facilities due to lack of symptoms in children, lack of diagnostic facilities & inappropriate sample collection in developing countries. Urine is sterile in the collecting system and urinary bladder however bacterial colonization is seen in urethra in healthy children. Main predisposing factors for UTI in children are urine stasis, bacterial adherence to

mucosa & congenital malformations.⁵

Most common causative organisms for UTI in children are Bacteria & Escherichia coli is responsible for 80% of the cases.⁶ Others include Klebsiella, Proteus, Enterobacter and Pseudomonas. In boys having kidney stones, Proteus mirabilis is a common causative organism responsible for UTI. In neonates & infants B Streptococcus and Enterococcus are responsible and in adolescent girls, Staphylococcus saprophyticus is the main culprit.⁷ Common contaminants of urine are Lactobacillus species, Corynebacterium, coagulase-negative staphylococci, and α hemolytic streptococci.⁸ untreated repeated UTI can lead to hypertension & renal failure.⁹ Other causes of UTI include viruses & less commonly

fungi. Viruses include lower urinary tract & are adenoviruses, enteroviruses. Rare fungi causing UTI are candida & aspergillus spp.^{9,10} Common predisposing factors to fungal infections are immune-compromised condition, diabetes mellitus, prolonged antibiotics use & indwelling catheter placement.¹¹

In a study by Alizadeh Taheri P and his colleagues has found that frequency of Escherichia coli was 64.4%, Enterobacter 19.2% and Klebsiella was 12.3% as causative organism of UTI in children.¹² Similarly Ghorashi Z et.al concluded that Escherichia coli was 77%, Enterobacter 9% and Klebsiella was 10% as causative organism of UTI in children with acute febrile illness.¹³

The local pattern of urinary tract organisms is essential for selection of the appropriate empirical antibiotics for children. Therefore we conducted this study to determine the frequency of common causative organisms of urinary tract infection in children. Aim of this study is to determine the frequency of common causative organisms of urinary tract infection in children with acute febrile illness.

Methods

This descriptive cross sectional study was conducted at Pathology Department, King Edward Medical University, Lahore from 15th July 2019 to 15th January 2020. After ethical approval of the study, 200 cases were included through non-probability consecutive sampling with 95% confidence interval, 4% margin of error and taking expected percentage of Enterobacter as 9%.¹³ Patients of age 3 months to 12 years of both genders with acute febrile illness due to UTI were included. Children with history of renal stones, urinary fungal infections & current antibiotic treatment were excluded. Demographic details of patients (age, gender, weight, duration of symptoms) were recorded. Informed consent was taken from parents/guardians for this study. After disinfection of the skin of genitals, mid-stream urine samples were collected by applying an adhesive, sealed, sterile collection bag. Then the samples were properly labeled & sent to the college pathology laboratory for culture. Urine culture was repeated if more than one organism discovered. Acute

febrile illness was labeled when child axillary temperature was $\geq 38^{\circ}\text{C}$ for < 48 hours by thermometer. Urinary Tract Infection was labeled when urine culture of child showed bacterial growth (one or more of Enterobacter, E.coli and Klebsiella) of >105 colony-forming units/ml by laboratory test. All the data was recorded on especially designed proforma & was analyzed by using program SPSS-22. Qualitative variables like gender, E.coli, Enterobacter and Klebsiella were described as percentages. Quantitative variables like age, duration of symptoms (febrile illness) and weight were presented as Mean \pm SD. Stratification was done with regard to age, duration of symptoms (febrile illness) and weight to see the effect of these variables on E.coli, Enterobacter and Klebsiella using the chi-square test. $p < 0.05$ was taken statistically significant.

Results

The mean age of the patients was 5.830 ± 2.83 years. There were 73.5% males & 26.5% females. Mean duration of febrile illness was 23.21 ± 7.46 hours and mean weight recorded was 20.68 ± 7.27 Kg. E. coli growth was present in 70% of the patients, Enterobacter in 15% and Klebsiella were found in 11% of the patients. Other organisms were identified in only 4% of the patients.

Table 1: Demographic Details of Patients

	N	200
Age (years)		5.83 ± 2.83
Gender	Male	147 (73.5%)
	Female	53 (26.5%)
Duration of febrile illness (hours)		23.21 ± 7.46
Weight (Kg)		20.68 ± 7.27

Table 2: Common Causative Organisms of UTI in Children (n=200)

Isolated Organism	n=200 (%)
E. coli	140 (70%)
Enterobacter	30 (15%)
Klebsiella	22 (11%)
Other s	8 (4%)

Table 3: Distribution of Isolated Organisms with Respect to Effect Modifiers

Parameter		E. coli	Enterobacter	Klebsiella
Age	< 5 years	57 (64.8%)	17 (19.3%)	11 (12.5%)
	6-12 years	83 (74.1%)	13 (11.6%)	11 (9.8%)
Duration of febrile illness	< 24 hours	57 (71.2%)	12 (15%)	8 (10%)
	> 24 hours	83 (69.2%)	18 (15%)	14 (11.7%)
Weight	< 20 kg	75 (69.4%)	18 (16.7%)	11 (10.2%)
	>20 kg	65 (70.7%)	12 (13%)	11 (12%)

Discussion

Our study showed that *E. coli* was the most prevalent (70%) causative organism of UTI in children from 3 months to 12 years of age. This finding of frequency of organisms is consistent with most of past studies.

Tebruegge M & his colleagues concluded that The commonest organisms of UTI isolated were *E coli* (67.4%), *Enterococcus faecalis* (8.4%) and *Klebsiella pneumoniae* (3.5%).¹⁴ In another study Chen HT et al. concluded that the most common cultured organism from urine of children was *Escherichia coli* same as our study.¹⁵ Mahyar A et al. in their study concluded that the most common growing organism in urine culture was *E-coli* (80/5%) followed by *Klebsiella*, *Proteus*, *Pseudomonas*, *enterobacter* and *Staphylococcus aureus*.¹⁶ Taheri PA et al. in their study concluded similar frequency of organisms.¹⁷

In a study by Alizadeh Taheri P and his colleagues found that frequency of *Escherichia coli* was 64.4%, *Enterobacter* 19.2% and *Klebsiella* was 12.3% as causative organism of UTI in children with acute febrile illness.¹²

Similarly Ghorashi Z et.al concluded that frequency of *Escherichia coli* was 77%, *Enterobacter* 9% and *Klebsiella* was 10% as causative organism of UTI in children with acute febrile illness.¹³

Ullah A et al also found that the most prevalent uropathogenic bacteria were *Escherichia coli* (41.4%), *Klebsiella pneumoniae* (15.5%) and *Proteus mirabilis* (13.8%).¹⁸

Similarly Balighian E & colleagues studied urinary tract infections in children & susceptibility to antibiotics & found similar pattern of bacteria.¹⁹

In comparison to other age groups, our study of uropathogen in 3 months to 12 years was of profound significance, as UTI is hard to diagnose at this age group, no local data was already available although our study was of small sample size & single centered. Hence it will give better idea of empirical antibiotic therapy.

Conclusion

The most common causative organism for UTI in children from 3 months to 12 years of age is *Escherichia coli* followed by *Enterobacter* and *Klebsiella*. Therefore Pediatricians should use empirical antibiotics in this age group as per these results till the availability of culture results.

Conflict of Interest

None

Funding Source

None

References

1. Robinson JL, Finlay JC, Lang ME, Bortolussi R, Canadian Paediatric Society, Infectious Diseases and Immunization Committee, Community Paediatrics Committee. Urinary tract infections in infants and children: diagnosis and management. *Paediatr Child Health*. 2014;19(6):315–9.
2. Tullus K. Fifteen-minute consultation: why and how do children get urinary tract infections? *Arch Dis Child Educ Pract Ed*. 2019;doi: 10.1136/archdischild-2018-315023.
3. Becknell B, Schober M, Korbel L, Spencer JD. The diagnosis, evaluation and treatment of acute and recurrent pediatric urinary tract infections. *Expert Rev Anti Infect Ther*. 2015;13(1):81–90.
4. Urinary tract infections in infants and children in developing countries in the context of IMCI. WHO. [Updated 2016, cited April, 2021]. Available from [http://apps.who.int/iris/bitstream/10665/69160/1/WHO_FCH_CAH_05.11.pdf]
5. Hickling DR, Sunt T, Wux R. Anatomy and physiology of the urinary tract: relation to host defense and microbial infection. *Microbiol Spectr*. 2015;3(4):10.
6. Bryce A, Hay AD, Lane IF, Thornton HV, Wootton M, Costelloe C. Global prevalence of antibiotic resistance in paediatric urinary tract infections caused by *Escherichia coli* and association with routine use of antibiotics in primary care: systematic review and meta-analysis. *BMJ*. 2016;352: 1939. doi: https:// doi.org/ 10.1136/bmj.i939
7. Naseri M, Tafazoli N. Etiologies of urinary tract infections in children considering differences in gender and type of infection. *J Paediatr Nephrol*. 2017; 5(3): 1-8.
8. Kline KA, Lewis AL. Gram-positive uropathogens, polymicrobial urinary tract infection, and the emerging microbiota of the urinary tract. *Microbiol Spectr*. 2016;4(2):10.
9. Desai DJ, Gilbert B, McBride CA. Paediatric urinary tract infections: Diagnosis and treatment. *Aust Fam Physician*. 2016;45(8):558-63.
10. Schlager TA. Urinary tract infections in infants and children. *Microbiol Spectr*. 2016;4(5): doi: 10.1128/microbiolspec.UTI-0022-2016.
11. Keren R, Shaikh N, Pohl H, Gravens-Mueller L, Ivanova A, Zaoutis L, et al. . Risk factors for recurrent urinary tract infection and renal scarring. *Pediatrics* 2015;136(1):e13-21.
12. Alizadeh-Taheri P, Navabi B, Khatibi E. Frequency and susceptibility of bacteria caused urinary tract infection in neonates: eight-year study at neonatal division of Bahrami Children's Hospital, Tehran Iran. *Iran J Public Health*. 2013;42(10):1126-33.
13. Ghorashi Z, Ghorashi S, Soltani-Ahari H, Nezami N. Demographic features and antibiotic resistance among children hospitalized for urinary tract infection in

- northwest Iran. *Infect Drug Resist.* 2011;4:171-6. doi: 10.2147/IDR.S24171
14. Tebruegge M, Pantazidou A, Clifford V, Gonis G, Ritz N, Connell T, et al (2011). The age-related risk of co-existing meningitis in children with urinary tract infection. *PLoS One*, 6(11): e26576.
 15. Chen HT, Jeng MJ, Soong WJ, Yang CF, Tsao PC, Lee YS, et. al. Hyperbilirubinemia with urinary tract infection in infants younger than eight weeks old. *J Chin Med Assoc.* 2011;74(4): 159-63.
 16. Mahyar A, Ayazi P, Hosseini S, Daneshi-Khohan MM. Comparison of clinical and para-clinical findings in urinary tract infection of neonates and infants. *Pediatr Res.* 2011;70(5): 766.
 17. Taheri PA, Navabi B, Shariat M. Neonatal Urinary Tract Infection: Clinical Response to Empirical Therapy versus In vitro Susceptibility at Bahrami Children's Hospital- Neonatal Ward: 2001-2010. *Acta Medica Iranica.* 2012;50(5): 348-52.
 18. Ullah A, Shah SR, Almugadam BS, Sadiqui S. Prevalence of symptomatic urinary tract infections and antimicrobial susceptibility patterns of isolated uropathogens in kohat region of Pakistan. *MOJ Biol Med.* 2018;3(3):85-9.
 19. Eric Balighian and Michael Burke, Urinary Tract Infections in Children, *Pediatr Rev.* 2018; 39 (1): 3-12.