

## Prospective Observational Assessment to Determine the Prevalence of Urinary Tract Abnormalities in Children Presented with first UTI

Ashish Kumar Basant<sup>1</sup>, Ankur Gautam<sup>2</sup>

<sup>1</sup>Senior Resident, Department of Pediatrics, Rama Medical College and Hospital, Hapur, India.

<sup>2</sup>Senior Resident, Department of Ophthalmology, Saraswathi Institute of Medical Sciences, Hapur, India.

---

Received: 02-11-2021 / Revised: 26-11-2021 / Accepted: 06-01-2022

Corresponding author: Dr. Ankur Gautam

Conflict of interest: Nil

---

### Abstract

**Aim:** Prevalence of Urinary Tract Abnormalities in Children with First Urinary Tract Infection.

**Material and methods:** This prospective observational study was carried out in the Department of Pediatrics, Rama Medical College and Hospital, Hapur, India from May 2020 to July 2020. Children with culture-proven first episode of UTI. During the study period, 100 children were diagnosed as culture proved first UTI. Children between 1 month and 12 years of age with the first episode of confirmed diagnosis of UTI during the study period and Children who are followed up for a minimum period of 6 months after diagnosis and starting the treatment were included in the study. Children with previously known urinary tract anomalies and Children with comorbid medical renal diseases were excluded from the study.

**Results:** Majority were in the age group of >5 years. Majority presented with fever. Urinary symptoms were present in 20% of the cases. Out of 100 children with culture proved UTI, only 45% had significant pyuria in centrifuged urine sample. The most common pathogen isolated in urine culture was E. coli. About 20% had abnormal finding in USG abdomen. Structural Among them, majority (22%) had hydronephrosis. DMSA scan was done in 60 children who showed abnormalities in 16. MCU was done in 45 children, which showed abnormalities in 15. The most common anomaly detected was VUR. Among 5 children with VUR, majority 40% had Grade I VUR. MCU was abnormal in 1 child who had normal USG findings.

**Conclusion:** UTI is a common pediatric problem with the potential to produce long-term morbidity. In children below 5 years, symptoms and signs are non-specific and routine urine examination may not yield persistent findings. Hence, high index of suspicion is necessary. The presence of VUR is a risk for recurrence of UTI and renal scarring.

**Keywords:** UTI, USG, VUR

---

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

---

### Introduction

UTI is one of the most common bacterial infections among infants and children. It may unmask underlying structural or functional anomalies of the urinary tract.

Early detection and management are pivotal to reduce significant morbidity, with kidney scarring, being the most worrisome long-term sequel.

Urinary tract infection (UTI) may be a presentation of variety of underlying urinary tract abnormality. The long-term complications of recurrent UTI are renal scarring, hypertension and chronic renal failure.[1,2] UTI in young children serve as a marker for abnormalities of the urinary tract.[3]

Several studies have shown that radiological abnormalities exist in as many as 25%-55% of children investigated after their first UTI, with one-third having vesicoureteral reflux (VUR). In most cases the first episode of UTI occurs in the 1st year of life and it is believed that young growing kidneys are more vulnerable to renal parenchymal damage.[4]

### Material and Methods

This prospective observational study was carried out in the Department of Pediatrics, Rama Medical College and Hospital, Hapur, India from May 2020 to July 2020 children with culture-proven first episode of UTI. During the study period, 100 children were diagnosed as culture proved first UTI. Children between 1 month and 12 years of age with the first episode of confirmed diagnosis of UTI during the study period and Children who are followed up for a minimum period of 6 months after diagnosis and starting the treatment were included in the study. Children with previously known urinary tract anomalies and Children with comorbid medical renal diseases were excluded from the study.

### Methodology

Detailed data on history and examination were recorded. More than 5 pus cells/high-power field in a centrifuged urine sample was taken as significant pyuria. On culture of urine, a colony count of >10<sup>5</sup> colony-forming unit (CFU)/mL microorganisms of a single species in midstream clean catch specimen, >50 10<sup>3</sup> CFU/mL microorganisms of a single specimen in catheterized sample, and any number of pathogens in suprapubic aspirated sample

was considered significant. Samples showing insignificant growth, mixed growth of two or more pathogens, or growth of non-pathogens were not considered as culture positive. Ultrasonography (USG) abdomen and pelvis were done in all children with culture- positive UTI. Dimercaptosuccinic acid (DMSA) evaluation was done at 2 months following UTI in all children with culture-positive UTI 5 years of age if USG was abnormal. MCU was performed with strict aseptic precautions, after the urine was sterile after 3–4 weeks following therapy. Information on bladder dynamics, reflux, and amount of residual urine was noted.

### Statistical analysis

The recorded data was compiled and entered in a spreadsheet computer program (Microsoft Excel 2007) and then exported to data editor page of SPSS version 25.0 (SPSS Inc., Chicago, Illinois, USA). For all tests, confidence level and level of significance were set at 95% and 5% respectively.

### Results

Majority were in the age group of >5 years [Table 1]. Majority presented with fever. Urinary symptoms were present in 20% of the cases. Out of 100 children with culture proved UTI, only 45% had significant pyuria in centrifuged urine sample. The most common pathogen isolated in urine culture was *E. coli*. About 20% had abnormal finding in USG abdomen. Structural Among them, majority (22%) had hydroureteronephrosis. DMSA scan was done in 60 children who showed abnormalities in 16. MCU was done in 45 children, which showed abnormalities in 15. The most common anomaly detected was VUR. Among 5 children with VUR, majority 40% had Grade I VUR. MCU was abnormal in 1 children who had normal USG findings. The results are compiled in [Table 2

**Table 1: Age and sex distribution of the study group**

Age (Years)	Sex		Total
	Male	Female	
<1	17	8	25
1-5	23	12	35
>5	18	22	40

**Table 2: USG, MCU, and DMSA findings**

Findings	USG (n=100)	DMSA (n=60)	MCU (n=45)
Normal	80	44	30
Cystitis	7	-	-
Bilateral hydronephrosis (HUN)	6	-	5
Vesicoureteral reflux (VUR)	1	-	5
Distended bladder with residual urine suggestive of posterior urethral valve	1	-	1
Obstructive uropathy suggestive of posterior urethral valve	1	-	-
Pelviureteric junction obstruction	1	-	1
Right hydronephrosis	1	-	1
Pyelonephritis	-	4	-
Left ureterocele	1	1	1
Right megaureter	1	1	1
Kidney scarring	-	10	-

## Discussion

A total of 100 children with culture-proven first episode UTI were enrolled to determine associated urinary tract abnormalities. Majority were in the age group of above 5 years, followed by 1–5 years. Male predominance was noted with a male to-female ratio of 4:1 in < 1 year. In a similar hospital-based study conducted by Singh et al,[5-8] of 135 patients, 32.5% were males and 67.4% were females forming a ratio of 1:2. Males outnumber females in children below 5 years and females outnumber males above 5 years in the study. Age and sex distribution obtained in the current study was similar to other hospital based studies done by Ali et al in

UAE, Raghubanshi et al in Lalitpur, Nepal, April Bay and Anacleto in Philippines.[9-11] We found that *E. coli* was the most common organism isolated, followed by *Klebsiella*, which was similar to the studies done by Zamir et al, Ahmadzadeh et al, Ponvilil et al and Saadeh et al.[12-15] Bryan et al reported *E. coli* as the most common urinary pathogen accounting for 85% of community-acquired UTI.[16] Bagga et al reported that about 90% of first symptomatic UTI and 70% recurrent infections were due to *E. coli*.[17] The studies by Mantadakis et al and Islam et al showed *E. coli* as most common organism but with varying proportions.[18,19] Gulati and Kher reported Gramnegative bacteria

as the most common etiologic agents, among which *E. coli* was the most common.[20] In the present study, 20% had abnormal finding in USG abdomen. Structural abnormality was seen in 14% which was similar to the studies by Hoberman et al of the 11 children with abnormalities in MCU, [21] majority were under 5 years of age which was similar to the studies done by Zamir et al,[12] In contrast, studies done by Ahmadzadeh et al,[13] and Sinha et al,[22] showed a higher incidence rate as their study group consisted only of children under 5 years of age. Kidney scarring was seen in 10% of children with UTI which was similar to the study done by Andrich et al. (10–15%).[23] Of the 9 children with kidney scarring, 8 had underlying urinary tract abnormalities and 2 were without underlying urinary tract abnormalities who were under 2 years. In the current study, the overall prevalence of urinary tract abnormalities was 14%, which was similar to the study done by Zamir et al,[12] In contrast, Ahmadzadeh et al,[13] reported a higher incidence of abnormalities (60.6%), as majority (77%) of their study group were children aged less than 5 years.

### Conclusion

UTI is a common pediatric problem with the potential to produce long-term morbidity. In children below 5 years, symptoms and signs are non-specific and routine urine examination may not yield persistent findings. Hence, high index of suspicion is necessary. The presence of VUR is a risk for recurrence of UTI and renal scarring.

### Reference

1. Jones KV, Asscher AV. Urinary tract infection and Vesicoureteral reflux. In: Edelman CM, Pediatric Kidney Disease, 2nd ed. Boston Little Brown 1992;1943-91.
2. Rushton HG. Vesicouretral reflux and scarring In: Barratt TM, Avener ED,

- Harmon WE. Pediatric nephrology, 4th ed, Baltimore, Lippincott william & wilkins 1999;851-71.
3. American Academy of Pediatrics. The diagnosis, treatment, and evaluation of the initial urinary tract infection in febrile infants and young children. Pediatrics 1999;103:843–52
4. Jacobson SH, Hansson S, Jakobsson B. Vesicoureteric reflux: Occurrence and long term risks. Acta Paediatr [Suppl] 1999;43:22-30
5. Gauthier M, Sterescu CI, Bergeron A, Brunet S, Taddeo S. Treatment of urinary tract infections among febrile young children with daily intravenous antibiotic therapy at a day treatment center. Pediatrics. 2004;114(4):469–476.
6. Robinson JL, Finlay JC, Lang ME, Bortolussi R. Urinary tract infections in infants and children: Diagnosis and management. Paediatr Child Health. 2014;19(6):315–325.
7. Leung A, Wong A, Leung A, Hon KL. Urinary Tract Infection in Children. Recent Pat Inflamm Allergy Drug Discov. 2019;13(1):2–18..
8. Singh SD, Madhup SK. Clinical profile and antibiotics sensitivity in childhood urinary tract infection at dhulikhel hospital. Kathmandu Univ Med J (KUMJ). 2013;11(44):319–343
9. Ali E, Osman A. Acute urinary tract infections in children in Khartoum State: Pathogens, antimicrobial susceptibility and associated risk factors. Arab J Nephrol Transplant. 2009;2:11–16.
10. Raghubanshi BR, Shrestha D, Chaudhary M, Karki BM, Dhakal AK. Bacteriology of urinary tract infection in paediatric patients. At KIST medical college teaching hospital. J Kathmandu Med Coll. 2014;3:21–26.
11. Bay AG, Anacleto FE. Clinical profile of UTI among children at the outpatient

- clinic of tertiary hospital. *PIDSP J.* 2010;11:10–16.
12. Zamir G, Sakran W, Horowitz Y, Koren A, Miron D. Urinary tract infection: Is there a need for routine renal ultrasonography? *Arch Dis Child.* 2004;89(5):466–474.
  13. Ahmadzadeh A, Askarpour S. Association of urinary tract abnormalities in children with first urinary tract infection. *Pak J Med Sci.* 2007;23(1):88–91.
  14. Ponvelil JJ, Gowda HN, Raj SM. Prevalence of urinary tract infection and sensitivity pattern amongst children less than 3 years of age with fever in a tertiary care hospital in South Karnataka. *Int J Basic Clin Pharmacol.* 2020;9(5):736–778.
  15. Saadeh SA, Mattoo TK. Managing urinary tract infections. *Pediatr Nephrol.* 2011;26(11):1967–1976.
  16. Bryan CS, Reynolds KL. Hospital acquired bacteremic urinary tract infection: Epidemiology and outcome. *J Urol.* 1984;132(3):494.
  17. Bagga A, Sharma J. UTI clinical features, evaluation and treatment. *Pediatr Today.* 2000;3:395–401.
  18. Mantadakis E, Tsalkidis A, Panopoulou M, Pagkalis S, Tripsianis G, Falagas ME, et al. Antimicrobial susceptibility of pediatric uropathogens in Thrace, Greece. *Int Urol Nephrol.* 2010;43(2):549–555.
  19. Islam MN, Khaleque MA, Siddika M, Hossain MA. UTI in children in tertiary level hospital in Bangladesh. *Mymensingh Med J.* 2010;19(4):482–488.
  20. Sanjeev G, Vijay K. Urinary tract infection. *Indian Pediatr.* 1996;33(3):211–218.
  21. Hoberman A, Charron M, Hickey RW, Baskin M, Kearney DH, Wald ER. Imaging studies after a first febrile urinary tract infection in young children. *N Engl J Med.* 2003;348:195–202.
  22. Sinha R, Mukherjee D, Sengupta J, Saha S, Banerjee S. Yield of imaging performed as per Indian society of pediatric nephrology guidelines in children with urinary tract infection. *Indian Pediatr.* 2017;54(9):749–51
  23. Wullt B, Bergsten G, Connell H, Röllano P, Gebretsadik N, Hull R. P fimbriae enhance the early establishment of *Escherichia coli* in the human urinary tract. *Mol Microbiol.* 2000;38(3):456–64.