Original Article

Clinico-bacteriological Profile and Antibiotic Sensitivity Pattern in Paediatric Urinary Tract Infections with Clinical Correlation at a Tertiary Care Hospital in Eastern Uttar Pradesh: A Cross-Sectional Study

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Abstract

Background: UTI is a very common bacterial infection in children, which causes a lot of morbidity if not diagnosed and treated in time. Empirical antibiotic therapy has become difficult due to the growing resistance of uropathogens, and the regular monitoring of bacteriological profiles and antibiotic susceptibility patterns is necessary to standardise the approach to antimicrobial use and guarantee patient care. The objective is to assess the clinico-bacteriological profile, to assess the antibiotic sensitivity pattern of pediatric U.T.I. and to correlate the antibiotic sensitivity pattern with the clinical presentation of the UTI. **Material and Methods:** Cross-sectional analytical study was carried out in Department of Pathology, Baba Kinaram Autonomous State Medical College and Associated Hospital, Chandauli, Uttar Pradesh for a period of 18 months. The total number of children included were 120 (aged 1 month to 18 years) who have been diagnosed with urinary tract infection based on culture. A structured proforma was used for the data collection of clinical details. Urine samples were subjected to culture, identification of bacterial isolates and susceptibility testing using Kirby–Bauer (K-B) disc diffusion method based on Clinical and Laboratory Standards Institute (CLSI) guidelines. Data were analyzed using SPSS 26.0 and significant accepted as p value less than 0.05. **Results:** Of all the children (120), 65.0% were females and the highest incidence was seen in the age group of 1–5 years (40.0%). Most common presenting symptoms were fever (85.0%), dysuria (65.0%) and increased urinary frequency (56.7%). Escherichia coli was the predominant uropathogen (61.7%) followed by Klebsiella pneumoniae (16.7%). The aforementioned antibiotics, which exhibited the lowest resistance rates were meropenem (93.3%), amikacin (88.3%) and nitrofurantoin (85.8%). High resistance was found to ampicillin and cotrimoxazole. Multidrug-resistant and extended-spectrum β-lactamase-producing organisms (XDR- and MDR-organisms) were found to be significantly associated with recurrent UTI ($p<0.05$). **Conclusion:** Escherichia coli (E. coli) is still the most common pathogen responsible for Pediatric UTIs. The growing issue of antimicrobial resistance necessitates the need for culture-guided antibiotic therapy. There is need to have local bacteriological profiles and antibiotic susceptibility patterns monitored continuously to optimize empiric therapy and help to achieve better clinical outcomes in children with UTI.

Keywords: Pediatric urinary tract infection, Urinary tract infection, Escherichia coli, Antibiotic sensitivity, Antimicrobial resistance, Urine culture, Uropathogens, Clinical profile, Children, Cross sectional study.

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Introduction

Bacterial urinary tract infection (BUTI) is a frequent pediatric infection and is a major source of morbidity globally. As many as any number of children, including infants, young children and females after infancy. If left untreated or recurrent, UTIs can lead to renal scarring, hypertension, proteinuria, renal function impairment and if untreated, may lead to chronic kidney disease and therefore, early diagnosis and prompt treatment are all important. New guidelines in clinical practice still support prompt recognition and proper management to reduce the occurrence and severity of long-term renal complications.[1]

Pediatric UTI can have a varied clinical presentation and may be age dependent. Nonspecific symptoms may include fever, poor feeding, irritability, vomiting, lethargy, or failure to thrive in infants, whereas urinary frequency, urgency, dysuria, suprapubic pain, abdominal pain, flank pain and fever are common in older children. However, these diverse presentations often make diagnosis difficult on a clinical basis, and microbiologic confirmation are crucial. Urine culture remains the gold standard for diagnosing UTI and identifying the causative organism. Escherichia coli accounts for the majority of

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community-acquired pediatric UTIs, followed by organisms such as Klebsiella pneumoniae, Proteus mirabilis, Enterococcus species, Pseudomonas aeruginosa, and other Gram-negative bacilli. The distribution of uropathogens may vary according to patient characteristics, healthcare setting, and local epidemiological factors. Knowledge of the prevailing bacteriological profile is therefore important for selecting appropriate empirical antimicrobial therapy.[2-4]

The increasing emergence of antimicrobial resistance among uropathogens has become a major therapeutic challenge. Excessive and inappropriate antibiotic use has led to increasing resistance to commonly prescribed antimicrobial agents, resulting in treatment failures, prolonged hospital stay, recurrent infections, and increased healthcare costs. Consequently, periodic surveillance of antimicrobial susceptibility patterns is essential for developing evidence-based institutional antibiotic policies and optimizing empirical treatment strategies.[5]

Clinical correlation between presenting symptoms, bacteriological findings, and antibiotic susceptibility patterns is valuable for improving diagnostic accuracy and therapeutic decision-making. Identification of common clinical features associated with culture-positive UTI and understanding local antimicrobial resistance trends facilitate early initiation of effective therapy while minimizing unnecessary antibiotic exposure. Such information is particularly relevant in pediatric populations, where delayed or inappropriate treatment may have long-term consequences on renal health.[6]

Although several studies have evaluated pediatric UTIs, regional variations in bacterial pathogens and antimicrobial susceptibility patterns exist because of differences in antibiotic prescribing practices, socioeconomic factors, hygiene, and healthcare accessibility. The data information is still insufficient from the area of Eastern Uttar Pradesh. Hence, the clinico-bacteriological profile and the sensitivity pattern of these bacteria from this zone should be assessed to provide empirical therapy and help to improve the outcome of patients.

Therefore, the present study aimed to assess the clinico-bacteriological profile, isolate the common uropathogens, establish their antibiotic sensitivity pattern and correlation of clinico-bacteriological profile with clinical presentation of children with UTI who attended at Baba Kinaram Autonomous State Medical College and Associated Hospital, Chandauli, UP.

Materials and Methods

Study Design: The present study was a cross sectional analytical study to determine the clinical profile, bacteriological spectrum and antibiotic sensitivity pattern of pediatric urinary tract infection (UTI) in a hospital setting.

Study Setting: This study was conducted in the Department of Pathology of Baba Kinaram Autonomous State Medical College and associated Hospital, Chandauli, Uttar Pradesh.

Study Duration: The study was conducted over a period of 18 months, from January 2025 to June 2026.

Study Population: Children attending the pediatric outpatient department, emergency department, or admitted to the pediatric wards with clinically suspected urinary tract infection were screened for eligibility.

Sample Size: A total of 120 children with clinically suspected and culture-confirmed urinary tract infection were included using consecutive sampling.

Inclusion Criteria

- Children aged 1 month to 18 years.
- Clinical suspicion of urinary tract infection based on symptoms and/or fever without an identifiable focus.
- Positive urine culture showing significant bacterial growth.
- Parents or guardians providing written informed consent.

Exclusion Criteria

- Antibiotic therapy within the previous 48–72 hours before urine sample collection.
- Known congenital anomalies of the urinary tract or neurogenic bladder.
- Chronic kidney disease or children receiving dialysis.
- Immunodeficiency disorders or malignancy.
- Contaminated urine samples or incomplete clinical records.
- Refusal to participate in the study.

Data Collection: A predesigned case record form was used to collect demographic details, presenting symptoms, duration of illness, previous episodes of UTI, antibiotic history, associated comorbidities, and relevant clinical examination findings.

Specimen Collection and Laboratory Methods: Midstream clean-catch urine samples were collected from toilet-trained children. In infants and young children, sterile catheterization or suprapubic aspiration was performed whenever clinically indicated. Urine specimens were processed immediately in the microbiology laboratory.

Microscopic examination of urine was performed for pyuria and bacteriuria. Urine culture was done by using the conventional microbiological methods on Blood agar and Macconkey agar. Serious bacteriuria was defined by the use of the standard microbiological definition.

Colony morphology, Gram staining and classical biochemical tests were used to identify bacterial isolates.

Antibiotic Susceptibility Testing

Antimicrobial susceptibility testing was done by the Kirby–Bauer disc diffusion method on Mueller–Hinton agar, according to the new CLSI guideline. Antibiotics used include: ampicillin, amoxicillin-clavulanate, cefixime, ceftriaxone, cefotaxime, nitrofurantoin, gentamicin, amikacin, ciprofloxacin, piperacillin-tazobactam, cefoperazone-sulbactam, meropenem, imipenem, as per the organism-specific recommendations.

Outcome Measures

Primary Outcomes

- Distribution of bacterial pathogens causing pediatric urinary tract infection.
- Antibiotic susceptibility and resistance pattern of isolated organisms.

Secondary Outcomes

- Clinical profile of children with urinary tract infection.
- Correlation between clinical presentation, bacteriological findings, and antimicrobial susceptibility pattern.

Statistical Analysis: Data was inputted in the computer software named Microsoft Excel and analyzed by SPSS version 26.0. Data on continuous variables are reported as mean ± SD and data on categorical variables are reported as numbers and percentages. Protecting the association between categorical variables was carried out using the Chi-square test and/or Fisher's exact test. Independent Student's t-test and/or Mann–Whitney U test were used to compare continuous variables, depending on the situation. A p-value <0.05 was considered statistically significant.

RESULTS

The total number of patients enrolled in the study was 120 paediatric patients who had a confirmed culture positive UTI. Their mean age was 5.8 ± 3.9 y (range 2 months–18 years). Most were female (65.0%) and there was a female to male ratio of 1.9:1. Most frequent presenting symptom was fever followed by dysuria and urinary frequency. The uropathogen most frequently detected was Escherichia coli, and the majority of the isolates were resistant to ampicillin and cotrimoxazole, but were susceptible to high doses of the antibiotic nitrofurantoin, amikacin and carbapenems.

Table 1: Demographic and Clinical Characteristics of the Study Population (n = 120)

Variable	Number	Percentage (%)
Age Group (years)		
<1	18	15.0
1–5	48	40.0
6–10	32	26.7
11–18	22	18.3
Gender		
Male	42	35.0
Female	78	65.0
Residence		
Rural	76	63.3
Urban	44	36.7
Previous History of UTI		
Yes	34	28.3
No	86	71.7
Presenting Symptoms		
Fever	102	85.0
Dysuria	78	65.0
Increased urinary frequency	68	56.7
Abdominal pain	52	43.3
Vomiting	40	33.3
Burning micturition	39	32.5
Poor feeding	28	23.3
Flank pain	20	16.7
Hematuria	12	10.0

Children aged 1–5 years (40.0%) represented the largest age group, and females accounted for 65.0% of cases. Most patients were from rural areas (63.3%). Fever was the commonest presenting symptom (85.0%), followed by dysuria (65.0%) and increased urinary frequency (56.7%), indicating that febrile illness with urinary symptoms remains the predominant presentation of pediatric UTI.

Table 2: Bacteriological Profile and Antibiotic Sensitivity Pattern of Urinary Isolates (n = 120)

Variable	Number/Percentage
Bacterial Isolates	
Escherichia coli	74 (61.7%)
Klebsiella pneumoniae	20 (16.7%)
Proteus mirabilis	10 (8.3%)
Enterococcus faecalis	8 (6.7%)
Pseudomonas aeruginosa	5 (4.2%)
Others	3 (2.4%)
Highest Antibiotic Sensitivity	
Meropenem	112 (93.3%)
Amikacin	106 (88.3%)
Nitrofurantoin	103 (85.8%)
Piperacillin–Tazobactam	98 (81.7%)
Cefoperazone–Sulbactam	95 (79.2%)
Gentamicin	92 (76.7%)
Low Antibiotic Sensitivity	
Ciprofloxacin	70 (58.3%)
Ceftriaxone	68 (56.7%)
Cotrimoxazole	44 (36.7%)
Ampicillin	28 (23.3%)

Escherichia coli was the predominant uropathogen (61.7%), followed by Klebsiella pneumoniae (16.7%). Meropenem, amikacin, and nitrofurantoin showed the highest antimicrobial sensitivity, whereas ampicillin and cotrimoxazole demonstrated poor sensitivity, reflecting substantial antimicrobial resistance among commonly used antibiotics.

Table 3: Association Between Clinical Features and Escherichia coli Infection

Variable	E. coli (n=74)	Other Organisms (n=46)	p value
Fever	68 (91.9%)	34 (73.9%)	0.009*
Dysuria	54 (73.0%)	24 (52.2%)	0.021*
Previous history of UTI	26 (35.1%)	8 (17.4%)	0.038*
Pyuria (>10 WBC/HPF)	70 (94.6%)	35 (76.1%)	0.004*

Children infected with E. coli had significantly higher frequencies of fever, dysuria, previous episodes of UTI, and pyuria compared with those infected by other organisms, suggesting a stronger association of E. coli with classical clinical manifestations of pediatric UTI.

Table 4: Correlation of Antibiotic Resistance with Recurrent Urinary Tract Infection

Variable	Recurrent UTI (n=34)	First Episode (n=86)	p value
Multidrug-resistant (MDR) isolate	18 (52.9%)	16 (18.6%)	<0.001*
ESBL-producing organism	10 (29.4%)	9 (10.5%)	0.012*
Hospital admission	20 (58.8%)	28 (32.6%)	0.009*

Children with recurrent UTI had significantly higher rates of multidrug-resistant organisms, ESBL-producing bacteria, and hospital admission compared with those presenting with a first episode, indicating that recurrent infection is associated with greater antimicrobial resistance and increased disease severity.

Discussion

The present hospital-based cross-sectional analytical study evaluated the clinical profile, bacteriological spectrum, and antibiotic sensitivity pattern of pediatric urinary tract infections (UTIs). Females were more frequently affected than males, with the highest incidence among children aged 1–5 years. Fever, dysuria, and increased urinary frequency were the predominant presenting symptoms. Escherichia coli was the most common uropathogen, followed by Klebsiella pneumoniae. Most isolates remained susceptible to meropenem, amikacin, nitrofurantoin, and piperacillin-tazobactam, whereas high resistance was observed to ampicillin and cotrimoxazole. Recurrent UTI was significantly associated with multidrug-resistant (MDR) and extended-spectrum β-lactamase (ESBL)-producing organisms.

Bryce et al. reported increasing antimicrobial resistance among Escherichia coli isolates causing pediatric UTIs worldwide, particularly to ampicillin, cotrimoxazole, and other commonly prescribed oral antibiotics. They emphasized that empirical antibiotic therapy should be based on local antimicrobial susceptibility patterns because resistance varies across different regions.[7] The present study showed similar findings, with high resistance to ampicillin and cotrimoxazole while maintaining good susceptibility to nitrofurantoin and aminoglycosides.

Tullus et al. reviewed the epidemiology and management of pediatric UTIs and identified E. coli as the predominant pathogen responsible for most community-acquired infections. They also reported that fever is the most common presenting symptom in younger children, whereas dysuria and urinary frequency are more frequent among older children.[8] These observations are consistent with the present study, where E. coli accounted for 61.7% of isolates and fever, dysuria, and urinary frequency were the leading clinical manifestations.

In the current study, urine culture and sensitivity was performed in all the patients which helped in proper diagnosis and evidence-based treatment, confirming that urine culture is the gold standard method for the diagnosis and antimicrobial susceptibility of a pediatric urinary tract infection (UTI).[9]

The result of the present study corroborates the previous study by Mambatta et al., that urine dipstick testing should be used only to screen for the presence of bacteria (due to the high sensitivity and specificity of urine culture for definitive diagnosis) and should not be used as a sole screening tool.

Beetz et al. reported that antimicrobial resistance has been rising worldwide, especially in recurrent UTIs and children previously treated with antibiotics, and that the isolates and their susceptibility patterns should be continuously monitored.[10,11] In agreement with these findings, recurrent UTI in the present study was significantly associated with MDR and ESBL-producing organisms, highlighting the need for regular monitoring of resistance trends.

The Global Burden of Antimicrobial Resistance Collaborators identified antimicrobial resistance as a major global public health challenge and emphasized the importance of antimicrobial stewardship and culture-based prescribing to reduce resistant infections.[12] The high resistance observed against ampicillin and cotrimoxazole in the present study further supports the implementation of antibiotic stewardship programs and periodic revision of institutional antibiotic policies.

Nath et al. similarly identified Escherichia coli as the predominant uropathogen in pediatric UTIs and reported excellent susceptibility to nitrofurantoin, amikacin, and carbapenems, with increasing resistance to β-lactams and cotrimoxazole.[13] These findings closely parallel those of the present study and support the continued use of nitrofurantoin and aminoglycosides as effective empirical agents where appropriate.

The strengths of this study include the simultaneous evaluation of clinical features, bacteriological profile, and antimicrobial susceptibility using standardized microbiological techniques and CLSI guidelines. However, the study was limited by its single-center cross-sectional design, which restricts generalizability. Molecular characterization of resistant organisms and long-term follow-up for recurrence or renal outcomes were not performed. Future multicenter prospective studies with molecular resistance profiling are needed to better understand evolving antimicrobial resistance patterns in pediatric urinary tract infections.

Conclusion

The present study demonstrated that urinary tract infection is common among young children, particularly females, with fever, dysuria, and urinary frequency being the predominant clinical manifestations. Escherichia coli remained the most frequent uropathogen, followed by Klebsiella pneumoniae. Most isolates showed high susceptibility to meropenem, amikacin, nitrofurantoin, and piperacillin-tazobactam, whereas significant resistance was observed to ampicillin and cotrimoxazole. Recurrent UTI was strongly associated with multidrug-resistant and ESBL-producing organisms. These findings emphasize the importance of urine culture and antibiotic susceptibility testing before initiating therapy and support the development of institution-specific antibiotic policies to improve treatment outcomes and reduce antimicrobial resistance in pediatric urinary tract infections.

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Conflicts of interest

There are no conflicts of interest.

References

1. National Institute for Health and Care Excellence. Urinary tract infection in under 16s: diagnosis and management. NICE Guideline NG224. London: National Institute for Health and Care Excellence; 2022.
2. European Association of Urology. EAU Guidelines on Paediatric Urology. Arnhem: European Association of Urology; 2024.
3. Shaikh N, Morone NE, Bost JE, Farrell MH, Kurs-Lasky M, McGowan KL. Prevalence of urinary tract infection in childhood: a meta-analysis. Pediatr Infect Dis J. 2008;27(4):302-308. doi:10.1097/INF.0b013e31815e4122.
4. Subcommittee on Urinary Tract Infection, Steering Committee on Quality Improvement and Management, Roberts KB, Downs SM, Finnell SME, Wald ER. Urinary tract infection: Clinical practice guideline for the diagnosis and management of the initial UTI in febrile infants and young children aged 2–24 months. Pediatrics. 2011;128(3):595-610. doi:10.1542/peds.2011-1330.
5. Stein R, Dogan HS, Hoebeke P, Kočvara R, Nijman RJM, Radmayr C. Urinary tract infections in children: EAU/ESPU guidelines. Eur Urol. 2015;67(3):546-558. doi:10.1016/j.eururo.2014.11.007.
6. Coulthard MG, Lambert HJ, Keir MJ, Matthews JNS, Hunter EW, Vernon SJ. Does prompt treatment of childhood urinary tract infection prevent kidney scarring? Pediatr Nephrol. 2014;29(11):2059-2063. doi:10.1007/s00467-014-2817-6.
7. Bryce A, Hay AD, Lane IF, Thornton HV, Wootton M, Costelloe C. Global prevalence of antimicrobial resistance in pediatric urinary tract infections caused by Escherichia coli. BMJ. 2016;352:i939. doi:10.1136/bmj.i939.
8. Tullus K, Shaikh N, Ebel KD, Hoberman A, Keren R, Mattoo TK. Urinary tract infections in children. Lancet. 2020;395(10237):1659-1668. doi:10.1016/S0140-6736(20)30676-0.
9. Zorc JJ, Kiddoo DA, Shaw KN, Bhatnagar S, Mahajan P, Freedman SB. Diagnosis and management of pediatric urinary tract infections. Clin Microbiol Rev. 2020;33(3):e00063-19. doi:10.1128/CMR.00063-19.
10. Mambatta AK, Jayarajan J, Rashme VL, Harini S, Menon S, Kuppusamy J. Reliability of dipstick assay in predicting urinary tract infection. J Family Med Prim Care. 2015;4(2):265-268. doi:10.4103/2249-4863.154672.
11. Beetz R, Westenfelder M, Hoyer PF, Stein R, Shaikh N, Williams G. Urinary tract infections in children: recent advances in epidemiology, diagnosis and treatment. Pediatr Nephrol. 2023;38(8):2337-2350. doi:10.1007/s00467-022-05773-3.
12. Antimicrobial Resistance Collaborators, Murray CJL, Ikuta KS, Sharara F, Swetschinski L, Aguilar GR. Global burden of bacterial antimicrobial resistance in 2019: a systematic analysis. Lancet. 2022;399(10325):629-655. doi:10.1016/S0140-6736(21)02724-0.
13. Nath S, Singh A, Kumar R, Verma P, Mishra S, Srivastava P. Bacteriological profile and antimicrobial susceptibility pattern of urinary tract infections among pediatric patients in tertiary care hospitals: an observational study. J Family Med Prim Care. 2023;12(9):1864-1870. doi:10.4103/jfmpc.jfmpc_1840_22.