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Clinical Presentation and Antimicrobial Resistance Pattern of Urinary Tract Infection in Children Aged 2 Months to 5 Years

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Abstract

Background: Antimicrobial resistance (AMR) has become an escalating global challenge, with increasing resistance to commonly used antibiotics complicating the management of pediatric UTI. The purpose of the study was to evaluate the clinical presentation and antimicrobial resistance patterns of urinary tract infections in children aged 2 months to 5 years.

Aim of the study: The aim of the study was to assess the clinical presentation and antimicrobial resistance patterns of urinary tract infections in children aged 2 months to 5 years.

Methods: This cross-sectional study at the Department of Paediatrics, Ad-din Momin Medical College and Hospital, Dhaka (May 2024–April 2025), included 200 children (2 months–5 years) with culture-confirmed UTI. After consent, clinical data and urine samples were collected and processed using standard microbiological methods. Antibiotic susceptibility testing followed CLSI guidelines. Data were analyzed descriptively with SPSS 25.0.

Results: Among 200 children with UTI, most were aged 2–5 years (42.0%), and 52.5% were female. Fever was the most common symptom (60.0%). *E. coli* (40.6%) and *Klebsiella spp.* (37.4%) were the predominant pathogens. *E. coli* showed high resistance to nitrofurantoin (92.1%), while *Proteus spp.* showed notable resistance to multiple agents. Gram-positive isolates exhibited high resistance to norfloxacin and erythromycin.

Conclusion: Urinary tract infections in children aged 2 months to 5 years are more common in females, frequently present with fever and abdominal pain, and show high resistance to commonly used antibiotics, highlighting the need for targeted therapy and continuous antimicrobial resistance surveillance.

Keywords: Clinical Presentation, Antimicrobial Resistance, Urinary Tract Infection

Introduction

Urinary tract infection (UTI) ranks among the most frequent bacterial infections in children [1,2] and represents a notable public health issue within the paediatric population [3]. Globally, the prevalence of paediatric UTI varies between 2% and 20%, with boys facing an estimated risk of 1–3% and girls 3–10% before reaching 14 years of age [4-6]. Children between 2 months and 5 years old are particularly susceptible, owing to their immature immune systems and anatomical factors that predispose them to infection [7]. Diagnosing UTI in young children is crucial because it can indicate underlying urinary tract abnormalities. Early detection is vital to protect the renal function of the developing kidney [8]. However, UTI in this age group are challenging to

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diagnose due to non-specific symptoms [9]. For instance, fever is often the primary sign in infants but can also arise from various other infections. Typical UTI symptoms like painful or frequent urination may be subtle or take time to appear in toddlers [10]. Delayed diagnosis and treatment increase the risk of severe complications, including renal scarring, hypertension, and chronic kidney failure [11]. Escherichia coli, a gram-negative bacterium from the Enterobacteriaceae family, is the leading cause of UTI, accounting for approximately 60–80% of cases [2,12]. Other common pathogens include Klebsiella pneumoniae, Proteus mirabilis, Staphylococcus saprophyticus, and Enterococcus species. In children with congenital anomalies or additional risk factors, infections caused by organisms other than E. coli occur more frequently, which can complicate treatment strategies [12,13].

Antimicrobial therapy has significantly advanced the management of UTI; however, antimicrobial resistance (AMR) has become an escalating global challenge [14]. Resistance to commonly used antibiotics—such as ampicillin, co-trimoxazole, nitrofurantoin, and fluoroquinolones—has increased over recent decades [15]. Due to the rising prevalence of resistant uropathogens, empirical antibiotic therapy should be informed by regional resistance patterns, particularly in developing countries. Failure to tailor treatment according to local AMR profiles contributes to treatment failures and sustained high rates of UTI [10]. Despite extensive global research on the clinical profile and microbiology of pediatric UTI, data specific to young children in the 2-month to 5-year age group remain limited in many developing regions. Most existing studies focus either on older children or lack detailed correlation between clinical presentations and antimicrobial susceptibility patterns in this vulnerable age bracket. Moreover, with antimicrobial resistance patterns varying significantly across geographic regions, there is a pressing need for localized surveillance to inform empirical treatment. In Bangladesh, few studies comprehensively address both the clinical features and resistance profiles of UTI in young children. The purpose of the study was to evaluate the clinical presentation and antimicrobial resistance patterns of urinary tract infections in children aged 2 months to 5 years.

Objective

- To assess the clinical presentation and antimicrobial resistance patterns of urinary tract infections in children aged 2 months to 5 years

Methodology & Materials

This cross-sectional observational study was conducted at the Department of Paediatrics, Ad-din Momin Medical College and Hospital, Dhaka, Bangladesh, from May 2024 to April 2025. A total of 200 children aged 2 months to 5 years, clinically and microbiologically diagnosed with urinary tract infection (UTI), were included based on predefined inclusion criteria.

Inclusion Criteria:

- Children aged between 2 months and 5 years.
- Clinically suspected UTI cases confirmed by positive urine culture ($\geq 10^5$ CFU/mL).
- Patients presenting with at least one suggestive symptom (e.g., fever, dysuria, abdominal pain, vomiting).

Exclusion Criteria:

- Children with known congenital urinary tract anomalies.
- Children who had received antibiotics within 72 hours prior to urine sample collection.
- Patients with incomplete medical records or contaminated urine samples.

After obtaining informed consent from parents or legal guardians, demographic and clinical data were collected through a structured questionnaire. This questionnaire also included specific questions regarding antibiotic usage, such as types of antibiotics prescribed, adherence to prescribed regimens, and whether antibiotic sensitivity tests had been performed to guide treatment. Midstream clean-catch urine samples were collected in sterile containers; for younger children, sterile urine collection bags were used under aseptic conditions. Samples were promptly transported to the microbiology laboratory for microscopic examination and culture using standard procedures. A urine culture yielding $\geq 10^5$ colony-forming units (CFU)/mL of a single organism was considered diagnostic of UTI. Bacterial identification was performed based on colony morphology, Gram staining, and biochemical testing. Antimicrobial susceptibility testing was conducted using the Kirby-Bauer disc diffusion method on Mueller-Hinton agar, following Clinical and Laboratory Standards Institute (CLSI) guidelines. Results were classified as sensitive, intermediate, or resistant. Both gram-negative and gram-positive isolates were tested against commonly used antibiotics, including ampicillin, cefotaxime, ceftriaxone, gentamicin, amikacin, co-trimoxazole, and norfloxacin. The sensitivity results were used to guide antibiotic selection and treatment in clinical practice. Data were entered into Microsoft Excel and analyzed using SPSS version 25.0. Descriptive statistics summarized demographic characteristics, clinical presentations, antibiotic usage patterns, and antimicrobial resistance profiles, expressed as frequencies and percentages.

Results

Table 2 shows the frequency of symptoms reported in

Table 1: Demographic Characteristics of the Study Population (n=200)

Age Group	Male (n)	Female (n)	Total (n)	Percentage (%)
<1 year	32	37	69	34.5
1–2 years	20	27	47	23.5
2–5 years	43	41	84	42
Total	95	105	200	100

Table 2: Clinical Symptoms Observed Among the Study Population (n=200)

Symptom	Frequency (n)	Percentage (%)
Fever	120	60
Dysuria	68	34
Abdominal pain	80	40
Loss of appetite	56	28
Vomiting	52	26
Foul-smelling urine	36	18
Constipation	28	14
Irritability	12	6

Table 3: Distribution of Uropathogens Isolated from the Study Population (n=155)

Type of Isolated Bacteria	No. of Isolates	Percentage (%)
Escherichia coli	63	40.6
Enterococcus spp.	11	7.1
Klebsiella spp.	58	37.4
Proteus spp.	5	3.2
Staphylococcus spp.	18	11.6

200 children with urinary tract infections. Fever was the most common symptom, present in 120 patients (60.0%), followed by abdominal pain in 80 patients (40.0%) and dysuria in 68 patients (34.0%). Other symptoms included loss of appetite (28.0%), vomiting (26.0%), and foul-smelling urine (18.0%).

Table 3 presents the distribution of bacterial pathogens isolated from urine cultures of 155 children. *Escherichia coli* was the most common isolate (63 cases, 40.6%), followed by *Klebsiella spp.* (58 cases, 37.4%) and *Staphylococcus spp.* (18 cases, 11.6%). *Enterococcus spp.* and *Proteus spp.* were isolated in 11 (7.1%) and 5 (3.2%) cases, respectively.

Table 4 summarizes the antibiotic resistance patterns of gram-negative uropathogens. *E. coli* showed the highest resistance to nitrofurantoin (92.1%), followed by ceftazidime (36.5%) and ceftriaxone (31.7%). *Klebsiella spp.* had the highest resistance to nitrofurantoin (34.5%) but remained mostly susceptible to other antibiotics. *Proteus spp.* showed the greatest resistance to ampicillin/amoxicillin and nitrofurantoin (60.0% each). The "Others" category includes less frequently used options such as injectable amikacin and combination therapies like ampicillin/amoxicillin with gentamicin, which showed relatively lower resistance rates.

Table 5 presents resistance profiles for gram-positive organisms. Both *Enterococcus spp.* and *Staphylococcus spp.* exhibited high resistance to norfloxacin (90.9% and 100.0%, respectively) and erythromycin (72.7% and 88.9%). Moderate resistance was observed for ampicillin/amoxicillin, gentamicin (HLG), and amikacin. Penicillin resistance was the lowest among the antibiotics tested in both groups.

Table 6 illustrates parental antibiotic usage behavior. A majority (80.0%) reported awareness of antibiotic overuse and adherence to completing full courses. However, all participants (100.0%) acknowledged using antibiotics without a prescription, highlighting a critical disconnect between knowledge and responsible practice.

Table 4: Antibiotic Resistance Pattern of Gram-Negative Bacterial Isolates

Antibiotic	E. coli (n = 63)	Klebsiella spp. (n = 58)	Proteus spp. (n = 5)
Nitrofurantoin	58 (92.1%)	20 (34.5%)	3 (60.0%)
Ceftazidime	23 (36.5%)	5 (8.6%)	2 (40.0%)
Ceftriaxone	20 (31.7%)	3 (5.2%)	2 (40.0%)*
Ampicillin/ Amoxicillin	19 (30.2%)	5 (8.6%)	3 (60.0%)
Cefotaxime	10 (15.9%)	3 (5.2%)	1 (20.0%)
Co-trimoxazole	8 (12.7%)	2 (3.4%)	2 (40.0%)*
Gentamicin	6 (9.5%)	2 (3.4%)	1 (20.0%)
Amikacin	2 (3.2%)	1 (1.7%)	0 (0.0%)
Others	5 (7.9%)	4 (6.9%)	1 (20.0%)

Table 5: Antibiotic Resistance Pattern of Gram-Positive Bacterial Isolates

Antibiotic	Enterococcus spp. (n = 11)	Staphylococcus spp. (n = 18)
Penicillin	2 (18.2%)	4 (22.2%)
Ampicillin/ Amoxicillin	6 (54.5%)	11 (61.1%)
Gentamicin (HLG)	5 (45.5%)	8 (44.4%)
Amikacin	4 (36.4%)	6 (33.3%)
Norfloxacin	10 (90.9%)	18 (100.0%)
Erythromycin	8 (72.7%)	16 (88.9%)

Table 6. Antibiotic Usage Patterns Among Parents

Practice	Yes	No
Overuse of antibiotics	80.00%	20.00%
Complete full antibiotic course	80.00%	20.00%
Use without prescription	100.00%	0.00%

Discussion

This study investigates the clinical manifestations and antimicrobial resistance patterns of urinary tract infections (UTI) in children aged 2 months to 5 years attending a tertiary care hospital in Bangladesh. UTI in this age group often present diagnostic and therapeutic challenges due to non-specific symptoms and rising antimicrobial resistance. The findings emphasize the predominance of fever and abdominal pain as presenting symptoms and confirm *Escherichia coli* as the most common uropathogen. Alarmingly high resistance to first-line antibiotics, particularly ampicillin and co-trimoxazole, highlights the urgent need for localized resistance surveillance and rational antibiotic use to guide empirical therapy and improve pediatric UTI outcomes.

In the present study, the highest proportion of urinary tract infection (UTI) cases was observed among children aged 2–5 years (42.0%), followed by those under 1 year (34.5%) and 1–2 years (23.5%), with a slight female predominance (52.5%). These findings are in concordance with Mathivanan et al.[16], who also reported a majority of cases in the 2–5 year age group and a higher incidence among females. Similarly, Lu et al.[17] found that most UTI cases occurred in children aged 1–3 years, aligning with our observed trend of increased incidence in the later infancy and early childhood period. Although Wathore et al.[18] noted the highest incidence in infants aged 1 month to 1 year, they too observed a female predominance (101 out of 180), consistent with our findings. Majumder et al.[19] and Nag et al.[20] also reported a higher incidence of UTI in female children, with Nag et al. noting that nearly half (48%) of the cases occurred in the 1–5 year age range and exclusively among females, reinforcing the trend of both age and sex distribution seen in our cohort. In this study, fever was the most commonly reported symptom among children with urinary tract infection (UTI), consistent with findings from several other studies and established guidelines. The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) highlights fever as a primary symptom of bladder infections, particularly in children under 2 years [21], aligning with our observation that 60% of cases presented with fever. Daniel et al.[22] also reported fever in 63.4% of their cases, while Shrestha et al.[23] found an even higher prevalence at 84%, along with notable rates of dysuria (54%), which was also observed in our cohort (34%). Favas et al.[24] identified fever in nearly all their cases (98.1%) and abdominal pain in 79.6%, further underscoring the prominence of febrile presentations in paediatric UTI. The consistency of fever as the leading symptom across these studies supports its role as a key clinical indicator for suspecting UTI in young children.

In our study, *Escherichia coli* remained the most frequently isolated uropathogen, accounting for 40.6% of culture-positive cases, followed closely by *Klebsiella spp.* at 37.4%. This distribution is consistent with prior studies such as Alsubaie et al.[25], who reported *E. coli* and *Klebsiella pneumoniae* as predominant pathogens in pediatric UTI. Similarly, TK et al.[26] found *E. coli* as the leading causative agent (48%), followed by *Klebsiella pneumoniae* (31.5%), underscoring the prominent roles of these bacteria. Notably, *Staphylococcus spp.* comprised 11.6% of isolates, a higher proportion than previously reported, indicating a potential rise in gram-positive involvement. Other isolates included *Enterococcus spp.* (7.1%) and *Proteus spp.* (3.2%), reflecting the microbial diversity typically observed in pediatric urinary tract infections. This study revealed high resistance rates to commonly used antibiotics such as ampicillin/amoxicillin, notably among *Escherichia coli* (92.1%) and *Proteus spp.* (60.0%). Resistance to co-trimoxazole was also significant, especially in *Proteus spp.* (40.0%) and *E. coli* (12.7%). These findings are consistent with Majumder et al.[19], who reported similarly elevated resistance to ampicillin and co-trimoxazole in pediatric uropathogens. Moderate resistance to third-generation cephalosporins—cefotaxime and ceftazidime—was observed, with *E. coli* showing approximately 31.7% resistance, while *Klebsiella spp.* exhibited lower rates. Gentamicin and amikacin resistance remained comparatively low, supporting their continued therapeutic value. Notably, nitrofurantoin resistance was highest in *E. coli* (92.1%) and substantial in *Klebsiella spp.* (34.5%) and *Proteus spp.* (60.0%). The "Others" category, which includes injectable amikacin and combination therapies like ampicillin/amoxicillin plus gentamicin, showed relatively low resistance across isolates. These antibiotic resistance patterns underscore the challenges of empirical treatment in pediatric UTI and highlight the critical need for continuous local surveillance to optimize antimicrobial stewardship.

In this study, *Enterococcus spp.* and *Staphylococcus spp.* exhibited high resistance to several commonly used antibiotics. Resistance to norfloxacin was particularly pronounced, with rates of 90.9% in *Enterococcus* and 100.0% in *Staphylococcus*, closely paralleling findings by Lalhmangaihzuali et al.[27], who reported norfloxacin resistance at 87.5%. Penicillin resistance was lower in our isolates, observed at 18.2% in *Enterococcus* and 22.2% in *Staphylococcus*. Moderate resistance was seen for ampicillin/amoxicillin (54.5% and 61.1%, respectively) and gentamicin (HLG) (45.5% and 44.4%). Amikacin resistance was comparatively lower, particularly in *Enterococcus* (36.4%). These resistance patterns highlight significant challenges in managing gram-positive uropathogens in pediatric UTI and underscore the critical need for local antimicrobial susceptibility data to guide effective therapy and reduce treatment failures in this vulnerable population. In this study, 80% of parents reported awareness of antibiotic overuse and completing the full antibiotic course. However, all admitted

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to using antibiotics without a prescription, highlighting a significant gap between knowledge and practice that calls for improved education and stricter regulation to promote responsible antibiotic use.

Limitations of the study

This study had some limitations:

- The study was conducted in a selected tertiary-level hospital.
- The study's limited findings may not be generalizable to other settings due to regional variations in bacterial epidemiology and antibiotic prescribing practices.

Conclusion

This study demonstrates that urinary tract infections in children aged 2 months to 5 years were slightly more common in females and most frequent in the 2–5 years age group. Fever, abdominal pain, and dysuria were the predominant clinical symptoms. *Escherichia coli* and *Klebsiella spp.* were the most commonly isolated pathogens. High resistance to nitrofurantoin was observed among *E. coli*, while *Proteus spp.* showed considerable resistance to multiple antibiotics. Gram-positive isolates, particularly *Staphylococcus* and *Enterococcus*, exhibited high resistance to norfloxacin and erythromycin. These findings highlight the importance of regular antimicrobial resistance monitoring and the need for judicious antibiotic prescribing to ensure effective management of pediatric UTI.

References

1. Watson AR, Taylor CM, McGraw M. Disorders of the urinary system. Forfar and Arneil's Textbook of Pediatrics, 6th eds. Neil McIntosh, Peter Helms, Rosalind Smyth. Churchill Livingstone, Spain 6 (2003): 613-20.
2. Leung AK, Wong AH, Leung AA, et al. Urinary tract infection in children. Recent patents on inflammation & allergy drug discovery 13 (2019): 2-18.
3. Oliveira EA, Mak RH. Urinary tract infection in pediatrics: an overview. Jornal de pediatria 96 (2020): 65-79.
4. Tullus K, Shaikh N. Urinary tract infections in children. The Lancet 395 (2020): 1659-68.
5. Shaikh N, Morone NE, Bost JE, et al. Prevalence of urinary tract infection in childhood: a meta-analysis. The Pediatric infectious disease journal 27 (2008): 302-8.
6. Vijaykumar M. Revised statement on management of UTI. Ind Pediatr 48 (2011): 709–17.
7. Adjei O, Opoku C. Urinary tract infections in African infants. International journal of antimicrobial agents 24 (2004): 32-4.
8. Schlager TA. Urinary tract infections in children younger than 5 years of age: epidemiology, diagnosis, treatment, outcomes and prevention. Paediatric drugs 3 (2001): 219-27.
9. Kaufman J, Temple-Smith M, Sanci L. Urinary tract infections in children: an overview of diagnosis and management. BMJ paediatrics open 3 (2019): e000487.
10. Bhargava K, Nath G, Bhargava A, Kumari R, Aseri GK, Jain N. Bacterial profile and antibiotic susceptibility pattern of uropathogens causing urinary tract infection in the eastern part of Northern India. Frontiers in Microbiology 13 (2022): 965053.
11. Montini G, Tullus K, Hewitt I. Febrile urinary tract infections in children. New England Journal of Medicine 365 (2011): 239-50.
12. Khan A, Jhaveri R, Seed PC, et al. Update on associated risk factors, diagnosis, and management of recurrent urinary tract infections in children. Journal of the Pediatric Infectious Diseases Society 8 (2019): 152-9.
13. A't Hoen L, Bogaert G, Radmayr C, et al. Update of the EAU/ESPU guidelines on urinary tract infections in children. Journal of pediatric urology 17 (2021): 200-7.
14. Habte TM, Dube S, Ismail N, Hoosen AA. Hospital and community isolates of uropathogens at a tertiary hospital in South Africa. South African Medical Journal 99 (2009).
15. World Health Organization. *Urinary tract infections in infants and children in developing countries in the context of IMCI*. Geneva: WHO (2005).
16. Mathivanan M, Visalakshi K. Study of the prevalence of urinary tract infection in febrile children. Int J Contemporary Pediatrics (2018): 2232.
17. Lu J, Liu X, Wei Y, et al. Clinical and microbial etiology characteristics in pediatric urinary tract infection. Frontiers in pediatrics 10 (2022): 844797.
18. Wathore SN, Wade P. Etiology and antimicrobial susceptibility pattern in children with community acquired urinary tract infection. Int J Contemp Pediatr 8 (2021): 993.
19. Majumder MM, Mahadi AR, Ahmed T, et al. Antibiotic resistance pattern of microorganisms causing urinary tract infection: a 10-year comparative analysis in a tertiary care hospital of Bangladesh. Antimicrobial Resistance & Infection Control 11 (2022): 156.
20. Nag BC, Rahman MM, Pervez M, et al. Clinical and bacteriological profile of urinary tract infection in children at a tertiary care hospital. International Journal of Contemporary Pediatrics 9 (2022): 1.

Dr. Rahman F, et al., Fortune J Health Sci
2025 DOI:10.26502/fjhs.322

21. Symptoms & causes of bladder infection in children. National Institute of Diabetes and Digestive and Kidney Diseases. NIDDK - National Institute of Diabetes and Digestive and Kidney Diseases (2025).

22. Daniel M, Szymanik-Grzelak H, Sierdziński J, et al. Epidemiology and risk factors of UTI in children—A single-center observation. Journal of personalized medicine 13 (2023): 138.

23. Shrestha LB, Baral R, Poudel P, Khanal B. Clinical, etiological and antimicrobial susceptibility profile of pediatric urinary tract infections in a tertiary care hospital of Nepal. BMC pediatrics 19 (2019): 1-8.

24. Favas K, TK MA, Noushadali AK, et al. Clinical presentation and diagnosis of pediatric urinary tract infections: A comprehensive study. National Journal of Physiology, Pharmacy and Pharmacology 14 (2024): 1466.

25. Alsubaie MA, Alsuheili AZ, Aljehani MN, et al. Antibiotic resistance patterns of pediatric community-acquired urinary tract infections in a tertiary care center in Jeddah, Saudi Arabia. The Journal of Infection in Developing Countries 17 (2023): 1430-5.

26. TK MA, AK N, Jose S. Antimicrobial susceptibility and resistance patterns in pediatric urinary tract infections. National Journal of Physiology, Pharmacy & Pharmacology 14 (2024).

27. Lalhmangaihzuali FE, Varte Z, Laldinmawii G. Antibiotic resistance pattern of uropathogens in urinary tract infections in children at State referral hospital, Falkawn, Mizoram, India. Int J Contemp Pediatr 5 (2018): 2108.

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