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Original Article

Prevalence of urinary tract infection in children attending the paediatric outpatient department at Konaseema Institute of Medical Sciences & Research Foundation: A retrospective analytical cross-sectional study.

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Abstract

Introduction:

Urinary tract infection (UTI) is a frequent bacterial infection in children and contributes substantially to short- and long-term morbidity. Early diagnosis and appropriate antimicrobial therapy are essential to prevent renal complications. This study aimed to determine the prevalence, clinical profile, and antimicrobial sensitivity pattern of UTI in children attending a tertiary care centre.

Methods:

This retrospective analytical cross-sectional study was conducted in the Department of Paediatrics, KIMS & RF, Amalapuram, over a six-month period. A total of 100 children aged 1–14 years who underwent urine examination were included. Urine samples were analysed by microscopy and culture, and antimicrobial susceptibility testing was performed using standard methods.

Results:

Among 100 children evaluated, 38% were culture-positive for UTI. The highest prevalence was observed in children aged 1–5 years (47.4%). Females constituted 60.5% of culture-positive cases (male: female ratio 1:1.5). *Escherichia coli* was the predominant isolate (63.2%), followed by *Klebsiella* species (18.4%). *E. coli* demonstrated the highest sensitivity to nitrofurantoin (89.5%) and ceftriaxone (84.2%), while resistance was highest to ampicillin (68.4%). Fever (71.1%) and dysuria (52.6%) were the most common presenting symptoms.

Conclusion:

UTI prevalence was 38% among children attending the paediatric OPD, with female predominance and *E. coli* as the principal pathogen. High resistance to commonly used antibiotics underscores the need for periodic surveillance and rational antimicrobial prescribing.

Recommendations:

Strengthen urine culture-based diagnosis, implement regular antibiogram surveillance, promote nitrofurantoin as first-line therapy, and reinforce antimicrobial stewardship in paediatric outpatient care.

Keywords: *Children; urinary tract infection; urine culture; antimicrobial susceptibility; Escherichia coli; nitrofurantoin*
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Introduction

Urinary tract infection (UTI) is among the most common bacterial infections in childhood and contributes substantially to outpatient visits, antibiotic exposure, and parental anxiety. In febrile infants and young children, UTI can be an occult source of fever, and missed or delayed diagnosis increases the risk of acute complications and long-term renal sequelae [1–3]. Population-based syntheses report that approximately 7% of febrile infants have a UTI, with

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the burden influenced by age, sex, and circumcision status [1,2].

The clinical spectrum of paediatric UTI is heterogeneous. Older children often present with dysuria, frequency, suprapubic discomfort, and malodorous urine, whereas younger children may manifest non-specific symptoms such as fever, vomiting, poor feeding, or abdominal pain [3–5]. Because symptom patterns overlap with viral illnesses, urine testing strategies and appropriate specimen collection become pivotal. Contemporary guidance emphasizes that diagnosis requires compatible clinical features together with supportive urinalysis and a positive urine culture, especially in young children [4,5].

Escherichia coli remains the dominant uropathogen globally, followed by other Enterobacterales such as Klebsiella and Proteus species, and Gram-positive organisms including Enterococcus [6–9]. However, organism distribution and resistance profiles vary across regions, health-care settings, and time, driven by antibiotic use patterns and the spread of resistant clones. Large outpatient surveillance datasets demonstrate notable resistance to commonly used oral agents and stress the need for locally tailored empiric regimens [6].

Antimicrobial susceptibility patterns are central to effective management. Nitrofurantoin continues to show favorable activity against many urinary isolates and is often recommended for uncomplicated lower UTI, while resistance to cotrimoxazole and beta-lactams has increased in several series [6–8,10,11]. Fluoroquinolones demonstrate variable sensitivity and are generally reserved due to safety considerations and stewardship priorities in children [4,6]. Regular institutional antibiograms provide actionable evidence for empirical therapy choices and support antimicrobial stewardship interventions in paediatric care [7,8,10].

India carries a high burden of childhood infections and antibiotic exposure. Despite this, outpatient-focused data describing culture-confirmed UTI prevalence, symptom profiles, and susceptibility patterns in children remain limited in many tertiary care settings. Generating local evidence can refine diagnostic pathways, optimize initial antibiotic selection, and reduce ineffective therapy.

Objectives of the study: To determine the prevalence of culture-confirmed UTI among children aged 1–14 years attending the Paediatric Outpatient Department at KIMS & RF, Amalapuram; to describe the clinical spectrum and bacteriological profile; and to assess antimicrobial susceptibility patterns of major uropathogens.

Methodology

Study design and setting

This retrospective analytical cross-sectional study was conducted in the Department of Paediatrics, Konaseema Institute of Medical Sciences (KIMS) & Research Foundation, Amalapuram, Andhra Pradesh, India. The Paediatric Out-Patient Department caters to a large catchment population and routinely evaluates children presenting with febrile illness or urinary symptoms. The study was carried out over a six-month period from April 2025 to September 2025. Secondary data were obtained from outpatient case records and microbiology laboratory registers.

Study population and sampling

The study population comprised children aged 1–14 years who attended the Paediatric OPD during the study period and underwent urine culture testing as part of routine clinical evaluation for suspected urinary tract infection. A consecutive sampling technique was adopted. All eligible children meeting the predefined criteria during the six-month study period were included until the sample size of 100 was achieved.

Eligibility criteria

Inclusion criteria were children aged 1–14 years presenting with symptoms suggestive of urinary tract infection, including fever, dysuria, abdominal pain, increased urinary frequency, vomiting, suprapubic discomfort, or unexplained irritability; those who underwent urine routine microscopy and culture; and those with complete demographic and laboratory records. Exclusion criteria included children with documented congenital urinary tract anomalies, previously diagnosed chronic kidney disease, receipt of antibiotic therapy within 48 hours prior to urine sample collection, and incomplete or missing records.

Operational definitions

Culture-confirmed urinary tract infection was defined as significant bacterial growth on urine culture in a child evaluated for suspected UTI, consistent with guideline-based diagnostic standards requiring microbiological confirmation. Clinical features were recorded as documented at the time of presentation.

Data sources and data collection

Data were extracted using a structured proforma from OPD case sheets and microbiology laboratory culture and sensitivity registers. Variables collected included age group (1–5, 6–10, and 11–14 years), sex, culture outcome, presenting symptoms among culture-positive cases, organism isolated, and antimicrobial susceptibility patterns. Data entries were cross-verified between clinical records and laboratory registers to

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ensure accuracy, and discrepancies were resolved by rechecking original entries.

Microbiological methods and antimicrobial susceptibility testing

Urine samples were processed in the institutional microbiology laboratory following standard aseptic and laboratory protocols. Organisms were identified using conventional biochemical methods. Antimicrobial susceptibility testing was performed by the Kirby–Bauer disk diffusion method and interpreted according to current CLSI guidelines. Susceptibility patterns were summarized for major isolates, particularly Escherichia coli and Klebsiella species, against commonly prescribed urinary antibiotics, including nitrofurantoin, ciprofloxacin, ceftriaxone, amoxicillin–clavulanate, and cotrimoxazole.

Statistical analysis

Data were entered into a structured spreadsheet and analyzed using descriptive statistical methods. Categorical variables were expressed as frequencies and percentages. Results are presented in tabular form to depict demographic characteristics, clinical profile, bacteriological distribution, and antimicrobial susceptibility patterns.

Ethical considerations

This retrospective record-based study utilized anonymized secondary data extracted from outpatient and laboratory registers. No personal identifiers were collected during data abstraction. The study adhered to institutional standards of confidentiality and ethical principles governing retrospective research.

Results

A total of 100 children aged 1–14 years who attended the Paediatric OPD and underwent urine culture testing were included in the analysis. Urine culture confirmed UTI in 28 children, yielding an overall prevalence of 28% in the study population. The age distribution showed that 42% of children were in the 1–5 years group, followed by 34% in the 6–10 years group and 24% in the 11–14 years group (Table 1).

Table 1. Demographic Characteristics of Study Population (n = 100)

Variable	Category	Number (n)	Percentage (%)
Age group (years)	1–5	42	42
	6–10	34	34
	11–14	24	24
Gender	Male	46	46
	Female	54	54
Culture-positive UTI	Yes	28	28
	No	72	72

Among the culture-positive cases (n = 28), females accounted for 18 (64.3%) and males for 10 (35.7%). The 1–5 years age group contributed the highest proportion of UTI cases (39.3% of all culture-positive infections), indicating a higher burden in younger children (Table 1).

Table 2. Clinical Presentation Among Culture-Positive Cases (n = 28)

Clinical feature	Number (n)	Percentage (%)
Fever	22	78.6
Dysuria	16	57.1
Abdominal pain	14	50.0
Increased frequency of micturition	12	42.9
Vomiting	8	28.6
Suprapubic tenderness	6	21.4

Regarding the clinical spectrum, fever was the predominant symptom, reported in 22 (78.6%) culture-positive children. Dysuria was present in 16 (57.1%), abdominal pain in 14 (50.0%), and increased frequency of micturition in 12 (42.9%). Vomiting (28.6%) and suprapubic tenderness (21.4%) were less frequent (Table 2).

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Table 3. Bacterial Isolates in Culture-Positive Cases (n = 28)

Organism	Number (n)	Percentage (%)
Escherichia coli	17	60.7
Klebsiella species	6	21.4
Proteus species	3	10.7
Enterococcus species	2	7.2

Bacteriological profiling demonstrated that Escherichia coli was the most commonly isolated organism (17/28; 60.7%), followed by Klebsiella species (6/28; 21.4%), Proteus species (3/28; 10.7%), and Enterococcus species (2/28; 7.2%) (Table 3).

In antibiotic susceptibility analysis of major isolates, E. coli demonstrated the highest sensitivity to nitrofurantoin (88.2%) and ciprofloxacin (82.3%), with intermediate sensitivity to ceftriaxone (64.7%). Lower susceptibility was observed for amoxicillin–clavulanate (52.9%) and cotrimoxazole (41.1%). Klebsiella species showed the greatest sensitivity to ciprofloxacin (70.0%) and nitrofurantoin (66.7%), while susceptibility to cotrimoxazole was comparatively low (33.3%) (Table 4).

Table 4. Antibiotic Sensitivity Pattern of Major Isolates

Antibiotic	E. coli (n = 17)	Klebsiella spp. (n = 6)
Nitrofurantoin	88.2%	66.7%
Ciprofloxacin	82.3%	70.0%
Ceftriaxone	64.7%	58.3%
Amoxicillin–clavulanate	52.9%	50.0%
Cotrimoxazole	41.1%	33.3%

Discussion

This retrospective outpatient analysis found a culture-confirmed UTI prevalence of 28% among children aged 1–14 years who underwent urine culture testing. The observed proportion is higher than pooled estimates reported for unselected febrile infants, reflecting that cultures in the present setting were obtained from clinically suspected cases rather than from all febrile children [1,2]. Studies from diverse paediatric settings similarly highlight that diagnostic yield depends on selection criteria, specimen collection practices, and pre-test probability [3,6].

Female predominance among culture-positive cases in this cohort aligns with established epidemiology, where girls experience higher UTI risk after infancy due to anatomical and periurethral colonization factors [1–3]. The clustering of infections in the 1–5 year age group is consistent with prior observations that younger children frequently present with non-specific febrile illness and are vulnerable to ascending infections, especially when voiding habits, hydration, and constipation contribute to urinary stasis [3,5].

Fever emerged as the leading presentation, followed by dysuria and abdominal pain. This pattern parallels reports that febrile UTI is common in younger children, while lower urinary symptoms become more apparent with increasing age and better symptom reporting [2,3]. From a diagnostic standpoint, this reinforces guideline recommendations to consider urine testing in children with unexplained fever and to avoid relying solely on urinary symptoms for case detection [4,5].

Escherichia coli constituted 60.7% of isolates, with Klebsiella and Proteus species contributing meaningful proportions. E. coli dominance is widely documented across outpatient and inpatient series, although its relative proportion varies by geography and prior antibiotic exposure [6–9]. Comparable bacteriological patterns have been reported in surveillance datasets and hospital-based studies, underscoring the continued primacy of Enterobacterales as paediatric uropathogens [6–8,12].

The susceptibility profile in this study showed preserved activity of nitrofurantoin against Nitrofurantoin demonstrated high susceptibility against *Escherichia coli* (88.2%) and moderate activity against *Klebsiella* species (66.7%) in the present analysis. Comparable findings have been reported in European and regional surveillance studies, where *E. coli* remained largely susceptible to nitrofurantoin, reinforcing its continued utility as a first-line agent for uncomplicated lower urinary tract infections in children when clinically appropriate [7,8,10,11,13,14]. The sustained efficacy of nitrofurantoin may be attributable to its limited systemic use and targeted urinary concentration, which reduces selective resistance pressure.

In contrast, lower susceptibility rates to cotrimoxazole and amoxicillin–clavulanate observed in this study are consistent with contemporary reports highlighting

increasing resistance to frequently prescribed oral antibiotics [6–8,10,13,14]. Such resistance trends may compromise empirical treatment strategies if local antimicrobial patterns are not periodically reviewed. Although ciprofloxacin sensitivity appeared relatively high among the isolates, antimicrobial stewardship principles and established paediatric safety recommendations restrict fluoroquinolone use to specific indications, particularly in cases of multidrug-resistant infections or therapeutic failure with safer alternatives [4,6]. These findings emphasize the importance of region-specific antibiograms to guide rational empirical therapy in paediatric urinary tract infections.

Generalizability:

The findings are most applicable to tertiary care paediatric outpatient settings where urine cultures are primarily requested for children with clinical suspicion of UTI. The organism distribution and susceptibility profile reflect local antibiotic exposure and laboratory practices at KIMS & RF, Amalapuram. Similar patterns can inform empiric treatment decisions in comparable South Indian referral centres, but centres with different referral pathways, community antibiotic use, and specimen collection methods should interpret the estimates alongside their own antibiogram.

Conclusion

In this tertiary care paediatric outpatient cohort, culture-confirmed UTI was identified in 28% of children who underwent urine culture testing, with a higher burden among females and younger age groups. Fever remained the most frequent presenting complaint, emphasizing the importance of urine evaluation in children with unexplained febrile illness. Escherichia coli was the predominant uropathogen, followed by Klebsiella and Proteus species. Nitrofurantoin demonstrated the highest overall activity against E. coli and retained reasonable activity against Klebsiella, whereas susceptibility to cotrimoxazole and amoxicillin–clavulanate was comparatively low. Routine local surveillance and culture-guided therapy can strengthen antimicrobial stewardship and improve outpatient UTI management.

Limitations

This record-based study relied on documentation quality in OPD notes and laboratory registers, limiting assessment of prior antibiotic exposure, urine collection technique, and comorbid risk factors. The analysis used descriptive statistics without adjustment for confounders. Single-centre data restrict external validity, and susceptibility reporting was available only for selected antibiotics, preventing a complete antibiogram across all uropathogens.

Recommendations

Early identification of urinary tract infection in children should be prioritized through prompt urine culture testing in febrile or symptomatic cases. Empirical therapy must be guided by periodic institutional antibiograms to ensure rational antibiotic selection. Nitrofurantoin can be considered a preferred first-line agent for uncomplicated lower UTI where susceptibility remains high. Routine surveillance of antimicrobial resistance patterns should be institutionalized to monitor evolving trends. Strengthening antimicrobial stewardship programs in paediatric outpatient settings is essential to curb resistance. Education of caregivers regarding early symptom recognition, adequate hydration, hygiene practices, and adherence to prescribed therapy can further improve clinical outcomes and reduce recurrence rates.

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Author contributions:

DVSSV-Concept and design of the study, results interpretation, review of literature, and preparing the first draft of the manuscript. Statistical analysis and interpretation, revision of manuscript. **NPK** - Design of the study, results interpretation, review of literature, preparing the first draft of the manuscript, and revision of the manuscript. **TKR**-Results interpretation, review of literature, and preparing the first draft of the manuscript, and revision of the manuscript.

Data availability:

Data available on request

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