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KEY WORDS: Pediatric UTI, bacteriological profile, antibiotic sensitivity, ESBL, culture positive.

CLINICAL AND BACTERIOLOGICAL PROFILE OF CULTURE POSITIVE URINARY TRACT INFECTION IN PEDIATRIC POPULATION IN TERTIARY CARE HOSPITAL: A CROSS-SECTIONAL OBSERVATIONAL STUDY

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ABSTRACT

Background: Urinary tract infection is one of the most common bacterial infections in humans and a major cause of morbidity. The etiology of UTI and the antibiotic sensitivity pattern varies with the widespread availability of antimicrobial agents; UTI has become difficult to treat because of appearance of pathogens with increasing resistance to antimicrobial agents. **Objectives:** To study the clinical features, bacteriological profile, antibiotic sensitivity patterns, and probable ESBL rates among culture positive UTIs in children. **Methods:** Cross-sectional observational study on 161 pediatric patients with culture positive UTI. **Results:** E. coli was the predominant organism (67%), fever was the most common symptom (88%), Amikacin, piperacillin-tazobactam, and carbapenems showed excellent sensitivity, and probable ESBL was detected in 51% of cases. **Conclusions:** Routine urine culture with ESBL testing is essential to guide therapy.

INTRODUCTION

Urinary tract infections (UTIs) are among the most frequent bacterial infections in children, associated with significant morbidity, including renal scarring and hypertension. Diagnosis is often delayed due to nonspecific symptoms. Identifying antibiotic resistance, including extended-spectrum beta-lactamase (ESBL) production, is critical to prevent treatment failure. This study aimed to evaluate the clinical presentations, bacteriological profile, antimicrobial susceptibility patterns, and probable ESBL rates among children with culture-proven UTIs.

MATERIALS AND METHODS

- **Design:** Cross-sectional observational study
- **Setting:** Paediatric Outpatient and inpatient department, Rajarajeswari Medical College & Hospital, Bangalore
- **Duration:** 12 months
- **Participants:** children aged 0–14 years with culture-positive urine samples

Children with co-existing other infections or nephrotic syndrome were excluded.Data was collected prospectively including demographics, symptoms, culture results, and antibiotic susceptibility. Probable ESBL was defined as resistance to third-generation cephalosporins with preserved carbapenem susceptibility.

RESULTS

1.Demographics

A total of 161 culture-positive pediatric UTI cases were analyzed. There were 89 females (55.3%) and 72 males (44.7%). The majority were in the 6 months to 2 years age group.

Table 1 : Age And Sex Distribution With Numbers And Percentages

Age Group	Female (n, %)	Male (n, %)	Total (n, %)
0-3m	11 (12.4%)	12 (16.7%)	23 (14.3%)
3m-6m	8 (9.0%)	15 (20.8%)	23 (14.3%)
6m-2y	27 (30.3%)	20 (27.8%)	47 (29.2%)
2y-5y	11 (12.4%)	13 (18.1%)	24 (14.9%)
5y-10y	25 (28.1%)	10 (13.9%)	35 (21.7%)
10y-14y	7 (7.9%)	2 (2.8%)	9 (5.6%)

2. Clinical Features

Fever was the most common symptom (88.2%), followed by pain abdomen (45.3%) and dysuria (27.3%). Other features included diarrhoea, cough/cold, and increased urinary frequency.

Table 2. Clinical Features Profile

Symptom	Percentage (%)	Number (n)
Fever	88.2	142
Pain abdomen	45.3	73
Dysuria	27.3	44
Increased urinary frequency	10.6	17
Diarrhoea	13.0	21
Constipation	1.2	2
Cough/cold	25.5	41

3. Bacteriological Profile

Escherichia coli was the most frequent isolate (67.1%), followed by Klebsiella pneumoniae (21.1%), Klebsiella oxytoca (9.9%) and Proteus mirabilis (1.9%).

Table 3. Bacteriological Profile

Organism	Percentage (%)	Number (n)
Escherichia coli	67.1	108
Klebsiella pneumoniae	21.1	34
Klebsiella oxytoca	9.9	16
Proteus mirabilis	1.9	3

4. Antibiotic Sensitivity

Amikacin, piperacillin-tazobactam, and carbapenems showed excellent sensitivity, while resistance to ampicillin and levofloxacin was notable. Probable ESBL production was identified in 82 cases, accounting for 50.9% of the study population.

Table 4. Antibiotic Sensitivity Pattern

Antibiotic	Sensitive (n, %)	Resistant (n, %)
AMP (Ampicillin)	13 (8.1%)	148 (91.9%)
CN (Cephalexin/ Cephaloridine)	119 (73.9%)	42 (26.1%)
CXM (Cefuroxime)	50 (31.1%)	111 (68.9%)
CTX/CTR (Cefotaxime/ Ceftriaxone)	76 (47.2%)	85 (52.8%)
CAZ (Ceftazidime)	84 (52.2%)	77 (47.8%)
AMC (Amoxicillin-Clavulanic acid)	74 (46.0%)	87 (54.0%)
PTZ (Piperacillin-Tazobactam)	161 (100.0%)	0 (0.0%)
AT (Aztreonam)	133 (82.6%)	28 (17.4%)
IMP (Imipenem)	153 (95.0%)	8 (5.0%)
MRP (Meropenem)	154 (95.7%)	7 (4.3%)
ETP (Ertapenem)	144 (89.4%)	17 (10.6%)
CIP (Ciprofloxacin)	121 (75.2%)	40 (24.8%)
LE (Levofloxacin)	7 (4.3%)	154 (95.7%)

NOR (Norfloxacin)	103 (64.0%)	58 (36.0%)
GEN (Gentamicin)	141 (87.6%)	20 (12.4%)
AK (Amikacin)	156 (96.9%)	5 (3.1%)
NIT (Nitrofurantoin)	103 (64.0%)	58 (36.0%)
COT (Cotrimoxazole)	95 (59.4%)	65 (40.6%)

5. ESBL Analysis (Extended spectrum Beta Lactamase)

Overall, E.Coli contributed the maximum proportion of ESBL(Extended spectrum Beta Lactamase) positive cases, highlighting its significance as the predominant multidrug-resistant uropathogen in pediatric urinary tract infections.

Table 5: Organism-wise ESBL Distribution Among Culture-positive Pediatric UTI Cases

Organism	Total_Isolates	ESBL_Positive	ESBL_Positive_%
Ecoli	108	46	42.59
KOX	16	2	12.5
KPN	34	9	26.47
PMI	3	0	0.0

Figures

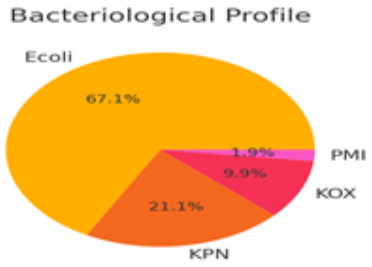

Figure 1. Distribution of bacterial isolates

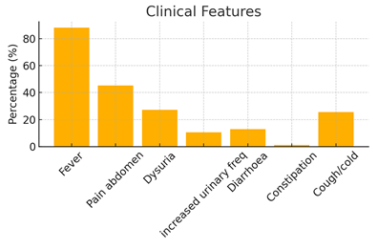

Figure 2. Clinical features distribution

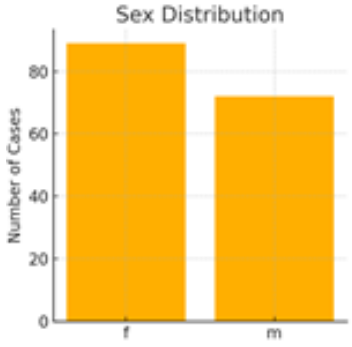

Figure 3. Sex distribution

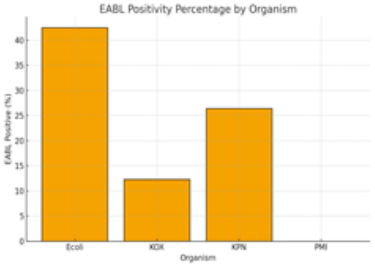

Figure 4: Organism-wise ESBL distribution in pediatric UTI cases

DISCUSSION

This study confirmed that *Escherichia coli* continues to be the predominant uropathogen in pediatric UTIs, which aligns with global and regional studies. The highest incidence in the 3–6 years group with female preponderance is consistent with the anatomical differences and behavioral risk factors in toilet-trained girls. Fever was the most consistent presenting feature, similar to other published series.

A probable ESBL rate of 50.9% was observed, reflecting the increasing burden of multidrug-resistant organisms in the community. High resistance to third-generation cephalosporins and preserved carbapenem susceptibility supports the hypothesis of widespread ESBL producers among Enterobacteriaceae. This finding is alarming because treatment options become restricted, and empiric therapy may fail if local resistance patterns are ignored.

Amikacin, piperacillin-tazobactam, and carbapenems demonstrated excellent activity against these isolates. This supports their consideration for empiric treatment of complicated or recurrent UTI while emphasizing that their use should be restricted to avoid emerging resistance.

The increasing ESBL prevalence underscores the importance of routine urine culture with antimicrobial susceptibility testing in every febrile child without a definite focus, especially those with recurrent UTIs. Confirmatory ESBL testing, which was not performed in this study, should be integrated in future research protocols to validate these findings.

In addition, renal ultrasound and voiding cystourethrogram may be warranted in recurrent or atypical infections to rule out vesicoureteric reflux or obstructive uropathies, which are known risk factors for renal scarring. Strict adherence to follow-up and imaging protocols in line with Indian Society of Pediatric Nephrology recommendations is vital.

Antimicrobial stewardship practices including patient and parent education, rational prescription habits, and periodic resistance surveillance will be crucial to prevent the further spread of resistant pathogens.

The present study also demonstrated that 35.4% of culture positive pediatric UTI isolates were ESBL producers. E. coli was the predominant ESBL-producing organism (42.59%), followed by Klebsiella pneumoniae (26.47%). High ESBL rates are concerning, as they limit the efficacy of commonly prescribed antibiotics, particularly third-generation cephalosporins, and necessitate the use of higher antibiotics such as carbapenems or amikacin. Our findings reinforce the need for routine ESBL screening in pediatric UTIs, careful antibiotic stewardship, and the formulation of hospital-based antibiograms to guide empiric therapy. These measures are critical to prevent treatment failures, reduce recurrence rates, and curb the spread of resistant pathogens in the community.

Our findings are consistent with other Indian studies including Rokkam et al., who also documented high rates of ESBL-producing E. coli in pediatric UTIs. Bency et al. similarly noted cephalosporin resistance patterns and urged rational antibiotic policy. Bagga et al., representing the Indian Society of Pediatric Nephrology, emphasized systematic urine culture testing and appropriate imaging for recurrent infections, to detect anatomical anomalies. Kothari et al. highlighted resistance to even nitrofurantoin, echoing the need for cautious empiric therapy. De et al. in a Kolkata-based study described a similarly high ESBL burden. National antimicrobial resistance data from Gandra et al. further underlines the growing multidrug-resistant threat. These data, along with the Vijaykumar et al. consensus guidelines,

support the present study's conclusion that routine urine culture, ESBL detection, and antibiotic stewardship are mandatory to protect children from long-term renal damage.

CONCLUSION

Pediatric UTIs remain common with E. coli predominance. About 50.9% of isolates were probable ESBL producers. Amikacin and carbapenems showed high sensitivity profiles and may be used in resistant cases. Routine urine culture with antibiotic sensitivity and ESBL testing should be implemented.

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