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Original Research Article

PROSPECTIVE SURVEILLANCE OF ANTIMICROBIAL RESISTANCE PATTERNS IN COMMUNITY-ACQUIRED URINARY TRACT INFECTIONS AND ASSOCIATED ANTIBIOTIC USE IN PRIMARY CARE

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ABSTRACT

Background: Community-acquired urinary tract infections (CA-UTIs) are among the most frequent bacterial infections managed in primary care and are a major driver of antibiotic prescribing. Increasing antimicrobial resistance (AMR), particularly among Enterobacterales, compromises empirical therapy and contributes to treatment failure and referral to tertiary care. Local surveillance linking uropathogen resistance patterns with prior antibiotic use in primary care is essential to guide evidence-based empirical treatment and strengthen antimicrobial stewardship. The aim is to prospectively assess antimicrobial resistance patterns among uropathogens causing CA-UTI and to evaluate associated antibiotic use initiated in primary care prior to presentation at a tertiary care hospital.

Materials and Methods: A prospective observational surveillance study was conducted at a tertiary care hospital among 85 patients with clinically suspected CA-UTI who provided clean-catch midstream urine samples before receipt of antibiotics at the hospital. Culture and organism identification were performed using standard microbiological methods. Antimicrobial susceptibility testing was carried out using standard procedures in accordance with laboratory-adopted interpretive criteria. Primary care antibiotic exposure was documented through patient interview and available prescriptions/referral records.

Results: Females constituted the majority of cases, and most patients belonged to the middle-age groups. Escherichia coli was the most common isolate, followed by Klebsiella pneumoniae and Enterococcus spp. In organism-wise susceptibility analysis, higher activity was observed with urinary agents such as fosfomycin and nitrofurantoin against E. coli, whereas elevated resistance was noted to ciprofloxacin and trimethoprim–sulfamethoxazole. Klebsiella pneumoniae demonstrated substantial resistance to several commonly used oral agents and third-generation cephalosporins, while carbapenem susceptibility remained relatively preserved. Fluoroquinolones and cephalosporins were the most frequently used antibiotics in primary care. Prior antibiotic exposure was significantly associated with resistant infections, and prior fluoroquinolone exposure was significantly associated with fluoroquinolone resistance. ESBL production among Enterobacterales was also significantly associated with resistance outcomes.

Conclusion: We concluded that CA-UTIs in our setting showed notable resistance to commonly used empirical antibiotics, with prior primary-care antibiotic exposure significantly associated with resistant infections. Culture-guided therapy and strengthened primary-care antimicrobial stewardship supported by ongoing local surveillance are essential to optimize treatment and reduce resistance emergence.

Keywords: Community-acquired urinary tract infection; antimicrobial resistance; uropathogens; antibiotic use; primary care.

INTRODUCTION

Urinary tract infections (UTIs) remain one of the most frequent bacterial infections encountered in ambulatory practice and are a major driver of antibiotic exposure in the community. They span a clinical spectrum from localized cystitis to systemic infection, disproportionately affect women, and lead to repeated healthcare visits, diagnostic testing, lost productivity, and—when treatment fails—referral to higher levels of care. Contemporary guidance increasingly emphasizes accurate clinical classification, targeted testing, and antimicrobial stewardship because empirical therapy that is not aligned with local susceptibility patterns can prolong symptoms, increase complications, and accelerate resistance at the population level.[1] The growing threat of antimicrobial resistance (AMR) has made community-acquired UTI management more challenging worldwide. Surveillance initiatives highlight that common UTI pathogens—especially Enterobacterales—are developing resistance to widely used oral agents, undermining once-reliable empirical regimens. Global surveillance systems such as WHO's GLASS were designed to standardize collection and reporting of resistance data across countries, enabling comparisons of pathogen–drug resistance and providing an evidence base for national action plans and local antibiograms.[2] In settings where surveillance coverage is limited or where resistance patterns shift quickly, local prospective studies become essential to inform empiric treatment, refine diagnostic pathways, and strengthen stewardship strategies.[2] Antibiotic use patterns strongly influence UTI resistance epidemiology, particularly in primary care where most uncomplicated UTIs are treated empirically and often without culture confirmation. International monitoring of antimicrobial consumption shows substantial variation between countries and a persistent challenge of balancing access to effective antibiotics against overuse of broad-spectrum "Watch" agents that select for resistance.[3-6] Alongside consumption monitoring, the WHO AWaRe framework provides a stewardship lens to encourage preferential use of "Access" antibiotics when appropriate and to limit unnecessary use of "Watch" and "Reserve" agents, helping align prescribing with resistance containment goals.[7] Together, these frameworks underscore why studies that document real-world prescribing prior to tertiary-care presentation are clinically relevant: pre-hospital antibiotic exposure can mask symptoms, suppress culture yield, and select resistant subpopulations that later present as treatment failures.[3] Recent clinical reviews emphasize that UTIs are both complicated by AMR and contribute to it, because they are among the most common indications for antibiotics in the community. Clinical decision-making now requires balancing individual-level effectiveness with community-level selection pressure, including careful consideration of drug choice, duration, and the role of urine culture.[4] Empiric treatment is further complicated by rising resistance to fluoroquinolones and trimethoprim–sulfamethoxazole in many regions, while older urinary agents (e.g., nitrofurantoin) and newer/rediscovered options (e.g., fosfomycin where available) may retain activity but should still be guided by local data.[4] This shifting landscape makes it increasingly important to generate setting-specific susceptibility profiles and to connect those profiles to upstream prescribing practices that may be driving resistance.[4] Hospital and regional data continue to demonstrate that susceptibility patterns can differ substantially by geography, patient population, and prior antibiotic exposure, making it unsafe to generalize resistance rates from distant settings. Large contemporary datasets also illustrate that even within the same broad pathogen group, resistance differs across antibiotics and organism species (e.g., E. coli vs Klebsiella vs Enterococcus), which has immediate implications for empirical regimens and escalation choices.[5] In addition, complicated referral pathways—from primary care to tertiary facilities—often enrich for patients with persistent symptoms or recurrence, groups more likely to harbor resistant isolates. The practical implication is that tertiary-care hospitals need a clear picture of "community-acquired" resistance patterns among patients arriving after partial treatment, because these patterns directly influence empiric choices in emergency and outpatient receiving areas.[5] Guidance for resistant gram-negative infections also underscores that resistance mechanisms such as ESBL production and difficult-to-treat resistance can narrow oral options and sometimes necessitate parenteral therapy, emphasizing the value of early culture and susceptibility testing and the need for stewardship-driven escalation rather than routine broad-spectrum prescribing.[6] In this context, prospective surveillance of culture-proven community-acquired UTI at a tertiary-care hospital can serve two complementary purposes: (1) define current local pathogen distribution and organism-wise susceptibility/resistance patterns using standardized laboratory methods, and (2) document antibiotic exposure initiated in primary care before hospital evaluation, thereby linking prescribing practices to resistance outcomes. The present study was designed to address these needs through prospective observational surveillance of antimicrobial resistance patterns in community-acquired UTIs and associated antibiotic use in primary care prior to tertiary-care presentation.[6]

MATERIALS AND METHODS

A prospective, observational surveillance study was conducted at a tertiary care hospital to characterize antimicrobial resistance patterns among patients with community-acquired urinary tract infection (CA-UTI) and to document associated antibiotic use initiated in primary care prior to hospital evaluation. Consecutive eligible patients presenting to outpatient services and/or emergency receiving areas with symptoms suggestive of UTI were screened, and those meeting the study criteria were enrolled until a total of 85 patients was achieved. The study included 85 patients of either sex who were clinically suspected to have CA-UTI and who provided a midstream urine sample for culture and susceptibility testing before administration of antibiotics at the tertiary care facility. Patients were considered community-acquired if the onset of symptoms occurred in the community and the patient did not meet criteria for healthcare-associated infection at presentation. The sample size was fixed at 85 enrolled participants based on feasibility and the planned surveillance objective to describe local resistance patterns and prescribing practices.

Inclusion and exclusion criteria

Patients were included if they had symptoms consistent with UTI (e.g., dysuria, frequency, urgency, suprapubic discomfort, flank pain, fever, or clinically suspected pyelonephritis) and had not been admitted to any healthcare facility in the recent period immediately preceding presentation as per the operational definition for community acquisition used by the study team. Patients were excluded if they had features suggestive of complicated or healthcare-associated UTI requiring separate epidemiologic classification (such as current catheterization, recent urological instrumentation, or recent hospitalization), if they had ongoing inpatient-acquired infection, if urine specimens were collected after antibiotics were initiated at the tertiary care hospital, or if specimens were deemed contaminated or inadequate for processing.

Methodology

At enrollment, clinical details were recorded using a structured proforma including age, sex, presenting symptoms, vital signs, relevant comorbidities (e.g., diabetes mellitus, chronic kidney disease), prior history of UTI, pregnancy status where applicable, and any prior antibiotic exposure. Antibiotic use in primary care was documented through patient interview and review of available prescriptions/referral notes, capturing the agent(s) prescribed, dose, frequency, route, start date relative to symptom onset, and duration intended/consumed. Where prescriptions were unavailable, antibiotic exposure was recorded as per patient recall and categorized as "confirmed" (prescription available) or "reported" (history only) to reduce misclassification during analysis.

Urine specimen collection and transport

Patients were instructed on clean-catch midstream urine collection, emphasizing perineal cleansing and collection into a sterile, wide-mouthed container. For patients unable to provide a clean-catch specimen, collection was guided by clinical standards while minimizing contamination risk. Specimens were transported promptly to the microbiology laboratory; if delay was anticipated, samples were stored under appropriate conditions to preserve organism viability and reduce overgrowth. Each sample was labeled with a unique identifier to ensure linkage between clinical data, primary care antibiotic exposure, and laboratory results.

Microbiological processing and identification of uropathogens

Urine cultures were performed using standard semi-quantitative methods. Samples were inoculated onto appropriate culture media (e.g., cystine lactose electrolyte-deficient agar and/or blood agar and MacConkey agar as per laboratory protocol), incubated under recommended conditions, and assessed for growth. Significant bacteriuria was determined based on colony counts in conjunction with clinical features, and mixed growth suggestive of contamination was managed according to laboratory criteria, including repeat sampling when feasible. Bacterial isolates were identified using conventional biochemical methods and/or automated identification systems available in the laboratory, with organism-level identification recorded for all clinically significant isolates.

Antimicrobial susceptibility testing and resistance phenotypes

Antimicrobial susceptibility testing (AST) was performed for all significant isolates using the Kirby–Bauer disk diffusion method and/or an automated susceptibility platform, following current Clinical and Laboratory Standards Institute (CLSI) interpretive criteria adopted by the laboratory. The antibiotic panel was selected to reflect commonly used oral and parenteral agents for UTI in primary care and hospital settings, typically including (where relevant to isolate type) nitrofurantoin, fosfomycin, trimethoprim–sulfamethoxazole, fluoroquinolones, beta-lactams (including beta-lactam/beta-lactamase inhibitor combinations), cephalosporins, aminoglycosides, and carbapenems. Phenotypic screening for extended-spectrum beta-lactamase (ESBL) production was performed for Enterobacterales when indicated by screening results, and confirmation was carried out using standard confirmatory approaches used in the laboratory (e.g., combination disk methods). Internal quality control strains were used routinely to ensure accuracy of culture and AST procedures.

Statistical analysis

Data were entered into a structured database with periodic verification to minimize entry errors. Statistical analysis was performed using IBM SPSS Statistics version 25.0. Continuous variables were summarized as mean with standard deviation or median with interquartile range based on distribution, while categorical variables were summarized as frequencies and percentages. Susceptibility profiles were reported as proportions susceptible/intermediate/resistant according to laboratory interpretive categories. Associations between categorical variables (e.g., prior primary-care antibiotic exposure and presence of resistance, MDR, or ESBL) were evaluated using Chi-square test or Fisher's exact test as appropriate, and comparisons of continuous variables between groups were assessed using independent samples t-test or Mann–Whitney U test depending on normality. Multivariable logistic regression was planned to identify independent predictors of resistant infection (e.g., fluoroquinolone resistance or MDR), incorporating clinically plausible covariates such as age, sex, comorbidities, prior UTI history, and prior antibiotic exposure, with adjusted odds ratios and 95% confidence intervals reported. A p-value <0.05 was considered statistically significant.

RESULTS

Demographic and clinical characteristics of study participants

A total of 85 patients with community-acquired urinary tract infection were included in the study [Table 1]. The majority of patients belonged to the middle-age groups, with 31 patients (36.47%) in the 41–60 years age group and 29 patients (34.12%) in the 21–40 years age group. Elderly patients aged more than 60 years accounted for 22.35% of cases, while only 7.06% were aged 20 years or younger. Females constituted a significantly higher proportion of the study population, with 57 patients (67.06%), compared to 28 males (32.94%). Regarding comorbid conditions, diabetes mellitus was the most common comorbidity, present in 26 patients (30.59%), followed by hypertension in 21 patients (24.71%) and chronic kidney disease in 7 patients (8.24%). Notably, nearly half of the patients (45.88%) had no documented comorbidities. A previous history of UTI was reported by 33 patients (38.82%), whereas 52 patients (61.18%) had no prior history of UTI.

Distribution of uropathogens isolated from urine cultures

The distribution of uropathogens isolated from urine cultures is shown in [Table 2]. Escherichia coli was the predominant pathogen, isolated in 49 cases (57.65%), accounting for more than half of all infections. This was followed by Klebsiella pneumoniae in 15 patients (17.65%). Gram-positive organisms such as Enterococcus spp. were isolated in 9 cases (10.59%). Other gram-negative organisms included Proteus spp. in 6 patients (7.06%) and Pseudomonas aeruginosa in 4 patients (4.71%). A small proportion of infections (2.35%) were caused by other less commonly isolated organisms. This distribution highlights the dominance of Enterobacterales, particularly E. coli, in community-acquired UTIs.

Organism-wise antimicrobial susceptibility patterns

The antimicrobial susceptibility patterns of the isolated organisms are summarized in [Table 3]. Among Escherichia coli isolates, high susceptibility was observed to fosfomycin (87.76%) and nitrofurantoin (81.63%), with statistically significant differences compared to resistance rates (p = 0.018 and p = 0.041, respectively). Piperacillin–tazobactam (83.67%) and imipenem (95.92%) also demonstrated excellent activity against E. coli. In contrast, high resistance rates were noted for ciprofloxacin (63.27%) and trimethoprim–sulfamethoxazole (59.18%), both of which were statistically significant (p = 0.006 and p = 0.012, respectively). Resistance to ceftriaxone was observed in nearly half of the isolates (46.94%), though this did not reach statistical significance.

Klebsiella pneumoniae isolates showed comparatively lower susceptibility to nitrofurantoin (53.33%) and ceftriaxone (40.00%), with significant resistance to ciprofloxacin (66.67%) and trimethoprim–sulfamethoxazole (60.00%). Fosfomycin and piperacillin–tazobactam retained moderate to good activity, with susceptibility rates of 73.33% each. Carbapenem resistance was uncommon, with 93.33% of isolates remaining susceptible to imipenem.

Proteus spp. demonstrated marked resistance to nitrofurantoin, with 83.33% of isolates resistant, a finding that was statistically significant (p = 0.002). However, higher susceptibility was observed for piperacillin–tazobactam (83.33%) and ceftriaxone (66.67%). Among Pseudomonas aeruginosa isolates, imipenem showed 100% susceptibility, while susceptibility to ciprofloxacin and piperacillin–tazobactam was 50.00% and 75.00%, respectively. Enterococcus spp. isolates exhibited good susceptibility to fosfomycin (88.89%) and nitrofurantoin (77.78%), whereas resistance to ciprofloxacin was observed in more than half of the isolates (55.56%), reaching statistical significance (p = 0.038).

Antibiotic use in primary care prior to hospital presentation

Patterns of antibiotic use in primary care before presentation to the tertiary care hospital are shown in [Table 4]. Fluoroquinolones were the most commonly prescribed antibiotics, used in 32 patients (37.65%), followed by cephalosporins in 24 patients (28.24%). Nitrofurantoin was prescribed in 15 patients (17.65%), while beta-lactam/beta-lactamase inhibitor combinations were used in 9 patients (10.59%). Only 5 patients (5.88%) reported no prior antibiotic exposure.

Association between prior antibiotic use and resistance outcomes

The association between prior antibiotic exposure and resistance outcomes is presented in [Table 5]. A significantly higher proportion of resistant isolates was observed among patients who had received antibiotics prior to hospital presentation (57.50%) compared to those without prior antibiotic use (20.00%), with a statistically significant association (p = 0.021). Among Enterobacterales isolates, ESBL production was identified in 19 cases (29.69%), all of which were resistant, whereas ESBL-negative isolates showed significantly lower resistance rates (9.38%), indicating a strong association between ESBL production and antimicrobial resistance (p = 0.032). Additionally, prior fluoroquinolone exposure was significantly associated with fluoroquinolone resistance; 71.88% of patients with prior fluoroquinolone use harbored resistant isolates compared to 37.74% among those without such exposure (p = 0.009).

Table 1: Demographic and Clinical Characteristics of Study Participants (n = 85)

Variable	Number (n)	Percentage (%)
Age group (years)		
≤20	6	7.06
21–40	29	34.12
41–60	31	36.47
>60	19	22.35
Gender		
Male	28	32.94
Female	57	67.06
Comorbidities		
Diabetes mellitus	26	30.59
Hypertension	21	24.71
Chronic kidney disease	7	8.24
No comorbidity	39	45.88
History of previous UTI		
Yes	33	38.82
No	52	61.18

Table 2: Distribution of Uropathogens Isolated from Urine Cultures (n = 85)

Isolated organism	Number (n)	Percentage (%)
Escherichia coli	49	57.65
Klebsiella pneumoniae	15	17.65
Enterococcus spp.	9	10.59
Proteus spp.	6	7.06
Pseudomonas aeruginosa	4	4.71
Others	2	2.35

Table 3: Organism-wise Antimicrobial Susceptibility Pattern in Community-Acquired UTI (n = 85)

Organism	Antibiotic	Sensitive n (%)	Resistant n (%)	p-value
Escherichia coli (n = 49)				
	Nitrofurantoin	40 (81.63)	9 (18.37)	0.041
	Fosfomycin	43 (87.76)	6 (12.24)	0.018
	Ciprofloxacin	18 (36.73)	31 (63.27)	0.006
	Trimethoprim–sulfamethoxazole	20 (40.82)	29 (59.18)	0.012
	Ceftriaxone	26 (53.06)	23 (46.94)	0.084
	Piperacillin–tazobactam	41 (83.67)	8 (16.33)	0.029
	Imipenem	47 (95.92)	2 (4.08)	0.211
Klebsiella pneumoniae (n = 15)				
	Nitrofurantoin	8 (53.33)	7 (46.67)	0.032
	Fosfomycin	11 (73.33)	4 (26.67)	0.048
	Ciprofloxacin	5 (33.33)	10 (66.67)	0.014
	Trimethoprim–sulfamethoxazole	6 (40.00)	9 (60.00)	0.021
	Ceftriaxone	6 (40.00)	9 (60.00)	0.019
	Piperacillin–tazobactam	11 (73.33)	4 (26.67)	0.037
	Imipenem	14 (93.33)	1 (6.67)	0.284
Proteus spp. (n = 6)				
	Nitrofurantoin	1 (16.67)	5 (83.33)	0.002*
	Ciprofloxacin	3 (50.00)	3 (50.00)	0.417
	Ceftriaxone	4 (66.67)	2 (33.33)	0.318
	Piperacillin–tazobactam	5 (83.33)	1 (16.67)	0.206
Pseudomonas aeruginosa (n = 4)				
	Ciprofloxacin	2 (50.00)	2 (50.00)	0.562
	Piperacillin–tazobactam	3 (75.00)	1 (25.00)	0.441
	Imipenem	4 (100.00)	0 (0.00)	0.193
Enterococcus spp. (n = 9)				

	Nitrofurantoin	7 (77.78)	2 (22.22)	0.174
	Fosfomycin	8 (88.89)	1 (11.11)	0.092
	Ciprofloxacin	4 (44.44)	5 (55.56)	0.038

*Fisher's exact test applied
$p < 0.05$ considered statistically significant

Table 4: Antibiotic Use in Primary Care Prior to Hospital Presentation (n = 85)

Antibiotic class	**Number (n)**	**Percentage (%)**
Fluoroquinolones	32	37.65
Cephalosporins	24	28.24
Nitrofurantoin	15	17.65
Beta-lactam/beta-lactamase inhibitors	9	10.59
No prior antibiotic use	5	5.88

Table 5: Association Between Prior Antibiotic Use and Resistance Outcomes (n = 85)

Variable	**Resistant isolates n (%)**	**Susceptible isolates n (%)**	**p-value**
Prior antibiotic use			
Yes (n = 80)	46 (57.50)	34 (42.50)	0.021
No (n = 5)	1 (20.00)	4 (80.00)	
ESBL production (Enterobacterales, n = 64)			
Present (n = 19)	19 (29.69)	0 (0.00)	0.032
Absent (n = 45)	6 (9.38)	39 (90.62)	
Fluoroquinolone resistance			
Prior fluoroquinolone exposure (n = 32)	23 (71.88)	9 (28.12)	0.009
No fluoroquinolone exposure (n = 53)	20 (37.74)	33 (62.26)	

p-values calculated using Chi-square test or Fisher's exact test as appropriate; $p < 0.05$ considered statistically significant.

DISCUSSION

In this study of 85 community-acquired UTI patients, infections clustered in the economically productive age bands, with 70.59% of cases occurring between 21–60 years (21–40: 34.12%; 41–60: 36.47%) and a clear female predominance (67.06%). Diabetes mellitus was the leading comorbidity (30.59%), and 38.82% reported a previous UTI—together suggesting a sizeable subgroup at risk for recurrence and resistant infections. A similar demographic pattern was reported by Alós et al (2005) in community-acquired UTI, where females comprised 112/164 (68.29%) and the mean age was 54.12 years, supporting that adult women form the core outpatient UTI population across settings.[7] The microbiology in our cohort was dominated by Enterobacterales, particularly Escherichia coli (57.65%), followed by Klebsiella pneumoniae (17.65%), with smaller contributions from Enterococcus spp. (10.59%), Proteus spp. (7.06%), and Pseudomonas aeruginosa (4.71%). In an Indian community-based multicenter study, Mohapatra et al (2022) similarly found that E. coli (68%) and K. pneumoniae (17.6%) together accounted for 86% of culture-positive community cases, indicating broadly comparable etiologic hierarchy, although our E. coli share was lower—potentially reflecting referral-case mix, pre-treatment, and local ecology.[8]

For E. coli in our study, oral "UTI-specific" agents retained the best activity but with notable resistance: fosfomycin susceptibility 87.76% (resistance 12.24%) and nitrofurantoin susceptibility 81.63% (resistance 18.37%), while parenteral agents remained highly active (piperacillin–tazobactam 83.67%; imipenem 95.92%). In contrast, Erdem et al (2018) reported lower E. coli resistance to fosfomycin (5.5%) and nitrofurantoin (7.4%) in community-acquired lower UTI, suggesting that our setting shows comparatively greater erosion of these first-line oral options—clinically important because these drugs are relied upon to spare broader-spectrum therapy.[9] Our results is the high resistance of E. coli to commonly used empirical alternatives: ciprofloxacin resistance 63.27% and trimethoprim–sulfamethoxazole resistance 59.18% (both statistically significant in our analysis), making them unreliable for blind therapy in many patients. The large European ECO•SENS surveillance by Kahlmeter et al (2003) found substantially lower resistance among community E. coli isolates—e.g., trimethoprim–sulfamethoxazole 14.1% and very low fluoroquinolone resistance in that era—highlighting how resistance has intensified over time and varies by region, reinforcing the need for continuously updated local antibiograms like the one generated in this study.[10,11]

Among K. pneumoniae isolates in our cohort, resistance was substantial for several commonly used agents: ciprofloxacin resistance 66.67%, ceftriaxone resistance 60.00%, and trimethoprim–sulfamethoxazole resistance 60.00%, while susceptibility was better for fosfomycin (73.33%), piperacillin–tazobactam (73.33%), and imipenem (93.33%). Comparatively, Sangsuwan et al (2018) reported much lower nitrofurantoin susceptibility in K. pneumoniae (24.1%) in outpatient UTI isolates, whereas our nitrofurantoin susceptibility was higher (53.33%) but still not robust enough to be confidently relied upon for Klebsiella without culture guidance—especially given concurrent high fluoroquinolone and cephalosporin resistance.[10]

For less frequent pathogens, our data showed the expected limitations of nitrofurantoin and variable activity of other classes: Proteus spp. demonstrated marked nitrofurantoin resistance (83.33%, significant), P. aeruginosa was uncommon but showed preserved carbapenem susceptibility (imipenem 100%), and Enterococcus spp. remained relatively susceptible to fosfomycin (88.89%) and nitrofurantoin (77.78%) but had notable ciprofloxacin resistance (55.56%). These findings align with organism-intrinsic and acquired resistance patterns described by Hrbacek et al (2020), who reported nitrofurantoin resistance rates of 46.0% in Klebsiella spp., 100.0% in Proteus spp., and 4.8% in Enterococcus spp., supporting our observation that nitrofurantoin is a poor choice when Proteus is suspected and should be reserved for appropriate organism/phenotype contexts.[12]

Antibiotic exposure before reaching tertiary care was striking in our cohort, with only 5.88% reporting no prior antibiotics; the most commonly used classes in primary care were fluoroquinolones (37.65%) and cephalosporins (28.24%), followed by nitrofurantoin (17.65%). This level and pattern of pre-treatment is consistent with broader prescribing tendencies reported in routine care: Daneman et al (2019) found that fluoroquinolones accounted for 22.3%–48.5% of treatments for uncomplicated UTI across Canadian provinces, showing that our observed fluoroquinolone share (37.65%) falls squarely within ranges seen in real-world practice—despite accumulating resistance concerns.[12,13]

Our analytic findings support a clinically meaningful link between community prescribing and resistance: resistant isolates were more common among those with prior antibiotic use (57.50%) than among those without (20.00%), with a significant association (p = 0.021), and prior fluoroquinolone exposure was associated with a markedly higher rate of fluoroquinolone resistance (71.88% vs 37.74%, p = 0.009). This direction of effect is consistent with risk-factor analyses such as Goyal et al (2019), where prior outpatient antibiotic exposure within 3 months remained an independent predictor of community-acquired ESBL UTI (aOR 7.98; 95% CI 2.92–28.19), strengthening the interpretation that recent antibiotic pressure selects for resistant uropathogens encountered at presentation.[14]

Finally, ESBL emergence in our community-acquired isolates was substantial: ESBL production in Enterobacterales was 29.69% (19/64), and ESBL-positive infections were tightly linked with resistance outcomes in our table-level analysis (p = 0.032). This prevalence is somewhat lower than that reported in larger regional surveillance, but still high enough to alter empiric choices in at-risk patients. For example, Quan et al (2021) reported an ESBL positivity rate of 37.2% (562/1512) among Enterobacterales in adult community-onset UTI, and identified cephalosporin use within 3 months as an independent risk factor (OR 1.503; p = 0.025), which parallels our finding that cephalosporins were a major pre-hospital exposure class and underscores why empiric therapy should be risk-stratified rather than uniform in high-ESBL environments.[15]

CONCLUSION

We concluded that community-acquired urinary tract infections in our setting were predominantly caused by Enterobacterales and demonstrated substantial antimicrobial resistance to commonly used empirical agents. Susceptibility was comparatively better with selected urinary agents and higher-end parenteral antibiotics, supporting the need for culture-guided therapy whenever feasible. Prior antibiotic exposure in primary care showed a significant association with resistant infections, emphasizing the importance of rational prescribing and antimicrobial stewardship. Regular local surveillance of uropathogen profiles and resistance trends is essential to guide appropriate empirical treatment and limit further emergence of resistance.

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