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Bacteriological Spectrum and Antimicrobial Susceptibility of Urinary Tract Infections in Inpatients and Outpatients at Public and Private Hospitals in Erbil City

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ABSTRACT:

Urinary tract infection is a prevalent bacterial infection affecting individuals of all ages, with *Escherichia coli* being the most common causative agent. Rising antimicrobial resistance poses a major challenge to empirical treatment, particularly in resource-limited settings. This study aimed to identify the most frequently isolated bacteria in urine samples from Erbil city and evaluate their antimicrobial susceptibility.

A cross-sectional study was conducted from September 2024 to March 2025, involving 501 patients clinically suspected of urinary tract infection. Midstream urine samples were collected and analyzed through general urine examination, culture, and antibiotic sensitivity testing using the Vitek-2 system. Sociodemographic and clinical data were collected through structured questionnaires.

Of 501 participants, 401 (80%) had positive urine cultures, with a significant female predominance (75.8%). Adults (18–64 years) constituted the majority (74.8%). *Escherichia coli* was the most frequently isolated pathogen (193 cases, 48.1%), followed by *Klebsiella pneumoniae* and *Pseudomonas aeruginosa* (32). Gram-negative bacteria accounted for 81.8% of all isolates. High resistance was observed to commonly used antibiotics, including ciprofloxacin, cephalosporins, and trimethoprim/sulfamethoxazole. Nitrofurantoin and amikacin showed the highest sensitivity against most isolates, especially *Escherichia coli*. Fluoroquinolone resistance was notably high among *Escherichia coli* and *K. pneumoniae*.

This study highlights the significant clinical multidrug-resistant Gram-negative pathogens in UTIs, with *Escherichia coli* as the primary cause. Nitrofurantoin and Amikacin remain effective options, while ciprofloxacin and several cephalosporins show decreasing efficacy.

Key words: Urinary Tract Infection, Gram Negative Bacilli, *Escherichia coli*, Antibiotic-Resistant.

1 INTRODUCTION

Urinary tract infection (UTI) is one of the most prevalent bacterial infections globally, affecting the urinary bladder, kidneys, or collecting system, with clinical manifestations ranging from mild cystitis to life-threatening septic shock [1]. The majority of cases are attributed to Enterobacteriaceae, particularly *Escherichia coli*, *Klebsiella* spp., *Enterobacter* spp., and *Proteus* spp., as well as Gram-positive pathogens such as *Enterococcus faecalis*, *Streptococcus agalactiae*, and *Staphylococcus* spp. Among these, *Staphylococcus saprophyticus* is a notable member of the coagulase-negative staphylococci [2]. Several host-related risk factors predispose individuals to UTIs, including female gender, prior infection history, sexual activity, and spermicide-based contraception. Additional determinants—such as aging, chronic comorbidities, and anatomical or functional urinary tract abnormalities—contribute not only to higher incidence but also to reduced therapeutic success. The presence of these so-called complicating factors defines an infection as "complicated," with common examples including urinary obstruction, catheterization, nephrolithiasis, chronic kidney disease, and diabetes mellitus [3]. Furthermore, lifestyle and behavioral variables play a role, as poor hydration,

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infrequent voiding, and obesity elevate risk, whereas breastfeeding and circumcision have protective effects, particularly in childhood [4].

UTI epidemiology shows a marked gender disparity. Females are affected more often, mainly because of the anatomy and physiology of the lower urinary tract and its closeness to reproductive organs [5]. About one in three women will have at least one UTI by age 24, and up to 50–60% will experience an episode in their lifetime [6]. Despite appropriate treatment, recurrence remains a significant clinical challenge, with 30–50% of women experiencing relapse within 6–12 months [7]. UTIs are broadly categorized as community-acquired (CA-UTI), typically presenting within 48 hours of hospital admission, or nosocomial (N-UTI), which emerge after 48 hours of hospitalization or following recent discharge. Prevalence is influenced by age, sex, catheterization, prior antimicrobial exposure, and hospitalization. Gram-negative bacteria remain the predominant etiological group, responsible for approximately 90% of cases [8].

Among these pathogens, *E. coli* remains the leading causative agent, accounting for roughly 90% of initial episodes in young women. Clinical infections are often associated with specific O-antigen serotypes of uropathogenic *E. coli* (UPEC), which possess a diverse arsenal of virulence factors that enable colonization and pathogenesis, including lipopolysaccharides, polysaccharide capsules, flagella, outer membrane vesicles, fimbriae, curli, adhesins, outer membrane proteins, and iron-acquisition systems [3], [9]. Both *E. coli* and *K. pneumoniae* frequently harbor extended-spectrum β-lactamases (ESBLs), conferring resistance to β-lactam antibiotics such as third- and fourth-generation cephalosporins and monobactams [10].

Therapeutically, first-line management of acute uncomplicated cystitis includes nitrofurantoin, trimethoprim–sulfamethoxazole, and fosfomycin, while β-lactams and fluoroquinolones are generally reserved as second-line options. Targeted regimens based on urine culture and susceptibility testing are particularly important in pregnancy and recurrent UTI, with cephalosporins (e.g., cefuroxime) or nitrofurantoin commonly preferred during gestation. In cases of uncomplicated pyelonephritis, fluoroquinolones remain the first-line option [11]. Ciprofloxacin, a fluoroquinolone with broad clinical applications—including otorhinolaryngological, respiratory, gastrointestinal, and urinary infections—acts primarily by inhibiting DNA gyrase subunit A, thereby halting DNA replication and disrupting cell wall integrity. Its dual availability in oral and intravenous formulations allows rapid attainment of therapeutic levels in most tissues with a favorable safety profile [12].

However, the rising prevalence of multidrug-resistant (MDR) uropathogens has complicated empirical management strategies. While MDR organisms were historically restricted to nosocomial infections, they are increasingly reported in community settings, driving higher morbidity, mortality, healthcare costs, and antimicrobial consumption [13]. Resistance to first-line therapies, particularly trimethoprim–sulfamethoxazole and fluoroquinolones, is frequently observed in MDR-associated UTIs, contributing to therapeutic failure. Against this backdrop, the present study was undertaken to identify the predominant UTI pathogens in the region and to evaluate their antimicrobial susceptibility profiles, with a particular focus on ciprofloxacin, which remains a widely prescribed agent in local clinical practice.

2 METHODOLOGY

A total of 501 cases that were suspected of UTI by signs and symptoms were included in this study. Urine specimens were collected from September 2024 until March 2025 and sent to the Microbiology departments of the laboratories for urine analysis, then for culture and sensitivity test. All the cases were collected in Erbil city from public and private hospitals. A questionnaire form prepared for patient profile and oral consent was taken from the patient before collecting data.

The procedure of urine culture was performed following the standard operating procedure. Briefly, ten microliters of urine with calibrated loop were streaked into CLED agar with additional media (Blood and MacConkey agar). Loop surface streak has been performed. A single streak was made across the center. Then, the inoculum was spread evenly in a cross-zigzag arrangement to the primary streak [14]. Then incubated at 37 °C aerobically for 24–48 h. The number of colonies was counted and calculated to a concentration with unit of colony-forming units per milliliter (CFU/ml).

The bacterial identification and antibiotic susceptibility testing were performed by the VITEK2 Compact system (bioMérieux, France). VITEK 2 GP and GN cards were used for bacterial identification. Different VITEK2 AST cards were used due to different laboratories and hospitals. The minimal inhibitory concentration (MIC) of each antibiotic was determined to be susceptible or resistant following the breakpoints of Clinical and Laboratory Standards Institute (CLSI 2024).

3 RESULT

Out of the 501 patients, 401 (80.0%) had positive urine cultures, confirming bacterial infection, while 100 patients (19.9%) had negative results. Sociodemographic and clinical information of the patients are described in Table 1. Out of 501 participants 379 (75.6%) were female, while 122 (24.4%) were male, indicating a predominance of female patients among individuals presenting with symptoms of urinary tract infection (UTI). The study included patients diagnosed or suspected of having urinary tract infections (UTIs). The mean age of the participants was 34.34 years from infants to the

elderly. Analysis of the patients' place of residence showed a marked urban predominance. Specifically, 436 patients (87.0%) resided in urban areas, while 53 (10.6%) were from rural settings. Among the study population, the majority were married (n = 301; 60.1%), followed by single individuals (n = 149; 29.7%). A smaller percentage of participants were widowed (n = 33; 6.6%) and divorced (n = 6; 1.2%). In terms of occupational status, only 101 participants (20.2%) were employed at the time of data collection, whereas the vast majority (n = 394; 78.6%) were non-employed, including students, homemakers, retirees, and the unemployed. (n = 175; 34.94%) of participant were inpatient while (n = 326; 65.06). Regarding infection history, 184 patients (45.8%) were experiencing a first episode of UTI, while 192 individuals (47.8%) had a recurrent UTI, indicating nearly equal distribution.

Table 1. Sociodemographic and Clinical frequencies.

Characteristics	Frequency	Percentage %
Age (years): Mean ±SD	34.34±19.53	
Residency		
Urban	448	89.4
Rural	53	10.6
Education level		
Educated	299	59.7
None educated	202	40.3
Marital state		
Married	313	62.5
Single	149	29.7
Widowed	33	6.6
Divorced	6	1.2
Employment status		
Employed	101	20.2
Non-employed	400	79.8
Inpatient/Outpatient		
Inpatient	175	34.94
Outpatient	326	65.06
Type of infection		
First time	196	48.9
Recurrent	205	51.1
Culture and sensitivity		
Positive	401	80
Negative	100	19.9

The age distribution of patients diagnosed with urinary tract infections (UTIs) in this study is presented in Table 2 and Figure 1. A total of 501 cases were analyzed, with the highest proportion observed in the 20–29 years age group (n = 135, 26.9%), followed by the 30–39 years group (n = 96, 19.2%). Notably, pediatric cases (0–9 years) accounted for 13.6% (n = 68), while adolescents (10–19 years) represented 7.6% (n = 38) of the total cases. Middle-aged and older adults exhibited a decreasing trend, with 40–49 years (n = 56, 11.2%), 50–59 years (n = 47, 9.4%), 60–69 years (n = 30, 6.0%), 70–79 years (n = 19, 3.8%), and over 80 years (n = 12, 2.4%).

Table 2. Age incidence among 501 participants.

age group	No.
0-9	68
10-19	38
20-29	135
30-39	96
40-49	56
50-59	47
60-69	30
70-79	19
80+	12
Total	501

The analysis of presenting symptoms among patients with (positive results) for urinary tract infection (UTI) reveals that the majority exhibit classic lower urinary tract symptoms. Dysuria (83.5%), urinary frequency (75.3%), and urgency (74.0%) are the most prevalent, Suprapubic pain, reported by 67.5% of patients. Systemic manifestations were less common, with fever observed in approximately 28.5% of cases. Several less frequent but clinically relevant symptoms were identified. Hematuria (17.5%) and back pain (18.8%). Urethral discharge (4.0%) and pruritus (11.3%) were rare but notable. Compared to positive urine culture group, the negative urine culture group's symptoms were lower. The most common symptoms were Dysuria (53.5%), suprapubic pain (50.0%), followed by urinary frequency (40.7%) (Table 3 and Figure 2).

Table 3. Frequency of Symptoms among the participants

	Positive urine cultures		Negative urine cultures	
Symptoms	**Count (Yes)**	**Percentage (%)**	**Count (Yes)**	**Percentage (%)**
Dysuria	334	83.5%	46	53.5%
Frequency	301	75.3%	35	40.7%
Urgency	296	74.0%	32	37.2%
Suprapubic Pain	270	67.5%	43	50.0%
Fever	114	28.5%	11	12.8%
Hematuria	70	17.5%	12	14.0%
Back Pain (Kidney Site)	75	18.8%	7	8.1%
Itching	45	11.3%	3	3.5%
Nausea/Vomiting	38	9.5%	3	3.5%
Urethral Discharge	16	4.0%	5	5.8%

A total of 401 urine culture-positive samples were analyzed to identify the causative bacterial pathogens associated with urinary tract infections (UTIs) as shown in Table 4. The most frequently isolated pathogen was *Escherichia coli*, accounting for 193 cases (47.19%), confirming its well-established role as the predominant uropathogen. *Klebsiella pneumoniae* was the second most common isolate, identified in 67 cases (16.38%), followed by *Pseudomonas aeruginosa* in 32 cases (7.82%), indicating the presence of opportunistic and potentially drug-resistant organisms in a considerable proportion of infections. Among the Gram-positive organisms, *Staphylococcus aureus* was isolated in 23 cases (5.62%), and *Staphylococcus saprophyticus* in 16 cases (3.91%) the latter being notably associated with UTIs in young women. Other Gram-positive cocci included *Staphylococcus hemolyticus* (3.42%), *Streptococcus agalactiae* (2.20%), *Enterococcus faecalis* (1.96%), *Enterococcus faecium* (0.98%), *Staphylococcus epidermidis* (0.98%), and *Streptococcus parasangyious* (0.24%). Less commonly isolated Gram-negative bacteria included *Proteus mirabilis* (3.42%), *Bulkholderia cepacia* (2.93%), *Enterobacter cloacae* (0.98%), *Acinetobacter baumannii* (0.98%), *Acinetobacter pittii* (0.24%), *Morganella morganii* (0.24%), and Micrococcus spp. (0.24%). Additionally, rare isolates such as *Kocuria vulgaris* (0.24%) were identified.

Table 4. Frequency of bacteria isolated from 401 patients with UTI.

Isolated Bacteria	**No.**	**percentage**
E. Coli	193	47.19%
K. pneumoniae	67	16.38%
P. aeruginosa	32	7.82%
S. aureus	23	5.62%
S. saprophyticus	16	3.91%
Proteous mirabilis	14	3.42%
S. hemolyticus	14	3.42%
Bulkholdera capecia	12	2.93%
S. agalactiae	9	2.20%
Enterococcus faecalis	8	1.96%
Enterococcus faecium	4	0.98%
S. epidermidis	4	0.98%
Acinetobacter baumannii	4	0.98%
Enterobacter cloacae	4	0.98%
Others*	5	1.2%

*other isolated bacteria were (*Streptococcus parasangyious*, *Acinetobacter pittii*, *Morganella morganii*, and Micrococcus spp. and *Kocuria vulgaris*.

The antimicrobial susceptibility testing of the most frequently isolated uropathogens (Table 5) demonstrated marked variation in susceptibility and resistance patterns across bacterial species and antibiotic classes. For *Escherichia coli* (n = 193), nitrofurantoin and amikacin showed the highest activity, with susceptibility rates of 77.2% and 79.3% respectively. Cefepime also exhibited substantial effectiveness (62.7% susceptible). In contrast, fluoroquinolones (ciprofloxacin and levofloxacin) revealed lower activity, with 37.3% and 46.1% susceptibility, respectively. Resistance was pronounced against cefazolin (76.2%) and trimethoprim/sulfamethoxazole (51.3%). Among *Klebsiella pneumoniae* isolates (n = 67), susceptibility rates were generally lower. Amikacin demonstrated the highest activity (61.2%), followed by cefepime (43.3%). High levels of resistance were observed for cephalosporins, with resistance rates exceeding 70% for cefazolin and ceftriaxone. Resistance to ciprofloxacin and levofloxacin was also substantial, at 76.1% and 70.1%, respectively. *Pseudomonas aeruginosa* (n = 32) displayed a characteristically resistant profile. Amikacin and cefepime showed relatively better efficacy, with 53.1% and 53.1% susceptibility, respectively. In contrast, cefazolin, amoxicillin/clavulanic acid, and nitrofurantoin were entirely or largely ineffective, with resistance rates approaching 100%. For *Staphylococcus aureus* (n = 18), fluoroquinolones demonstrated notable activity, with 44.4% and 61.1% susceptibility to ciprofloxacin and levofloxacin, respectively. Nitrofurantoin exhibited the highest susceptibility (77.8%), while all isolates were resistant to cephalosporins. *Proteus mirabilis* (n = 10) showed the greatest susceptibility to amikacin (70%), followed by nitrofurantoin (50%). High resistance was recorded for ciprofloxacin and levofloxacin (80% and 70%, respectively). *Staphylococcus haemolyticus* (n = 14) showed marked susceptibility to nitrofurantoin (85.7%) and moderate response to amikacin and levofloxacin (64.3% and 57.1%, respectively). Resistance was highest against cefazolin and ceftriaxone (100% and 57.1%, respectively). For *Burkholderia cepacia* (n = 8), susceptibility was low across all agents tested. Amikacin (50%) and cefepime (37.5%) demonstrated modest activity, while resistance was highest against cefazolin and nitrofurantoin (100% and 87.5%, respectively). Lastly, *Staphylococcus saprophyticus* (n = 16) showed high susceptibility to nitrofurantoin and amoxicillin/clavulanic acid 87.5% respectively. Moderate resistance was observed against trimethoprim/sulfamethoxazole (43.8%).

Table 5. Antimicrobial susceptibility profile of most frequently isolated bacteria.

Antibiotics		*E. Coli* (n=193)	*K. pneumoniae* (n=67)	*P. aeruginosa* (n=32)	*S. aureus* (n=18)	*Proteus mirabilis* (n=10)	S. haemolyticus (n=14)	*Bulkholderia cepacia* (n=8)	*S. saprophyticus* (n=16)
Cefazolin	S	46	13	0	0	4	0	0	13
	R	147	54	32	0	6	0	8	3
Ceftazidime	S	99	23	14	0	3	8	3	14
	R	94	44	18	0	7	6	5	1
Ceftriaxone	S	86	19	9	0	4	6	1	0
	R	107	48	23	0	6	8	7	0
Cefepime	S	121	29	17	0	4	9	3	0
	R	72	38	15	0	6	5	5	0
Amikacin	S	153	41	17	0	7	9	4	0
	R	40	26	15	0	3	5	4	0
Ciprofloxacin	S	72	16	12	8	2	7	1	13
	R	121	51	21	10	8	7	7	3
Levofloxacin	S	89	20	11	11	3	8	1	14
	R	104	47	21	7	7	6	7	2
Nitrofurantoin	S	149	24	4	14	5	12	1	14
	R	44	43	28	4	5	2	7	2
Trimethoprim/Sulfa	S	94	16	5	8	2	6	3	9
	R	99	51	27	10	8	8	5	7
Amoxicillin/Clavulanic Acid	S	136	26	0	7	3	4	1	12
	R	57	41	32	11	7	10	7	4

*** S= Sensitive, R= Resistant**

4 DISCUSSION

Urinary tract infection (UTI) remains one of the most frequent bacterial infections affecting the urinary tract, including the bladder (cystitis), kidneys (pyelonephritis), and urethra. While *Escherichia coli* and other Enterobacteriaceae are the primary causative organisms, Gram-positive bacteria such as *Enterococcus* and *Staphylococcus* spp. also play a contributory role.

In this study, nearly half of the UTI cases occurred among young adults aged 20–39 years, indicating either increased susceptibility or higher detection rates in this demographic group. This observation aligns with global epidemiological data, which demonstrate that UTI incidence peaks around the age of 35 for both sexes before stabilizing [15]. Age-specific surveillance has further highlighted a rising trend of UTIs among individuals aged 15–39 years [16]. While most infections in our study were confined to the lower urinary tract, the presence of systemic symptoms suggests that a proportion of patients may have developed upper tract infections or experienced early bacterial dissemination. Importantly, nausea and vomiting reported in 9.5% of patients, when observed in conjunction with fever and back pain, may serve as clinical red flags for pyelonephritis. Literature supports this classic triad of acute pyelonephritis, comprising fever, costovertebral angle pain, and nausea or vomiting [17]. These symptoms often evolve rapidly and necessitate urgent evaluation, given the risk of complications such as renal scarring, sepsis, and systemic dissemination [18]. Clinically, high rates of dysuria, frequency, and urgency remain hallmark diagnostic features, yet the co-occurrence of systemic manifestations in nearly one-fifth of cases underscores the need for vigilance and consideration of pyelonephritis. Furthermore, the detection of urethral discharge in a subset of patients suggests that sexually transmitted infections should be excluded through appropriate diagnostic screening to ensure accurate management.

Our microbiological findings reaffirm *E. coli* as the predominant uropathogen, followed by *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, and *Proteus mirabilis*. This distribution is consistent with regional reports. A retrospective investigation in Tehran (2019–2020) identified *E. coli* (72.3%) as the leading pathogen, followed by *Klebsiella* spp. (13.4%), *P. aeruginosa* (4.8%), and *Proteus* spp. (1.7%), closely mirroring our proportions [19]. Similarly, in Kermanshah, Iran, *E. coli* and *K. pneumoniae* predominated, both demonstrating substantial resistance to ciprofloxacin, trimethoprim–sulfamethoxazole, and third-generation cephalosporins—findings that parallel our resistance profiles [20]. A more recent survey from Baghdad, Iraq, reported *E. coli* (44.7%), *K. pneumoniae* (38.6%), and *P. aeruginosa* (15.7%) as the principal isolates, again reflecting our pathogen distribution [21]. Collectively, these studies highlight the persistent dominance of Gram-negative organisms, coupled with rising multidrug resistance (MDR), underscoring the importance of region-specific antibiograms for guiding empirical therapy.

The antimicrobial susceptibility profile in our study further emphasizes these concerns. Amikacin and nitrofurantoin demonstrated high efficacy against *E. coli* and *K. pneumoniae*, while elevated resistance was observed to ciprofloxacin, trimethoprim–sulfamethoxazole, and β-lactams. Comparable results have been reported across the region. In Zakho, Kurdistan, amikacin retained strong activity against common uropathogens, whereas amoxicillin, ampicillin/cloxacillin, and cotrimoxazole were largely ineffective [22]. In Qal'at Saleh hospital (Iraq), *E. coli* isolates were highly susceptible to amikacin and ciprofloxacin, with nitrofurantoin remaining effective against Gram-negative pathogens despite widespread MDR [23]. Similarly, Iranian studies have consistently demonstrated high nitrofurantoin susceptibility (87–97%) among community-acquired *E. coli*, confirming its continued role as a reliable empirical agent for uncomplicated UTIs, in contrast to poor efficacy of amoxicillin, ampicillin, and first-generation cephalosporins [24]. Data from southern Iraq further corroborate these findings, where amikacin and imipenem displayed the highest in vitro activity, while MDR *E. coli* accounted for 94% of isolates, emphasizing the urgent need for antimicrobial stewardship [25]. Turkish surveillance reports also reflect similar resistance dynamics, with ESBL-producing isolates demonstrating high resistance to cefuroxime (98.8%) and ciprofloxacin (67.6%), moderate resistance to nitrofurantoin (~15%), but relatively low resistance to amikacin (8.7%) and meropenem (1.4%) [26].

On a global scale, surveillance studies have documented alarming increases in resistance. In South India, resistance rates over a decade rose significantly, including against amikacin (+8.7%), nitrofurantoin (+11.2%), ciprofloxacin, and carbapenems [27]. A recent systematic review confirmed the high worldwide prevalence of fluoroquinolone resistance among *E. coli* from community-acquired UTIs, presenting a major challenge for empirical therapy [28]. Moreover, experimental work has revealed synergistic antimicrobial activity when combining amikacin with nitrofurantoin against MDR *E. coli*, suggesting a potential therapeutic strategy to counter rising resistance [29].

Taken together, our findings reinforce established global and regional patterns: *E. coli* and *K. pneumoniae* remain the leading uropathogens, resistance to fluoroquinolones and β-lactams is increasingly pervasive, and amikacin together with nitrofurantoin continues to offer preserved therapeutic efficacy. These results highlight both the enduring diagnostic value of clinical symptomatology and the indispensable role of culture-based susceptibility testing in ensuring rational, evidence-based management of UTIs.

CONCLUSION

This study highlights a significant burden of UTIs in Erbil city, with a predominance of female and adult patients. *Escherichia coli* emerged as the most common causative agent, accounting for nearly half of all culture-positive cases. The bacterial spectrum was dominated by Gram-negative organisms, though Gram-positive bacteria were also frequently isolated. Nitrofurantoin showed excellent efficacy against *E. Coli*, supporting its continued use in treating uncomplicated lower UTIs. Amikacin emerged as the most consistently effective antibiotic across both Gram-positive and Gram-negative isolates for complicated infections or cases requiring broad-spectrum intravenous therapy. Ciprofloxacin, though moderately effective against some isolates, exhibited high resistance rates, signaling caution in its empirical use without culture confirmation. Notably, many isolates showed multidrug resistance (MDR), especially among *P. aeruginosa*, and Burkholderia cepacia, which complicates treatment and highlights the importance of antibiotic stewardship.

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CONFLICTS OF INTEREST

The author declares no conflict of interest.

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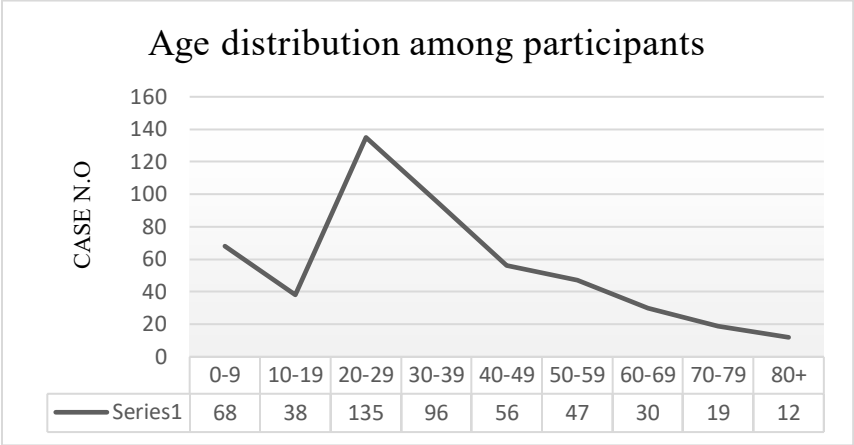

FIGURE 1. Age distribution among participants

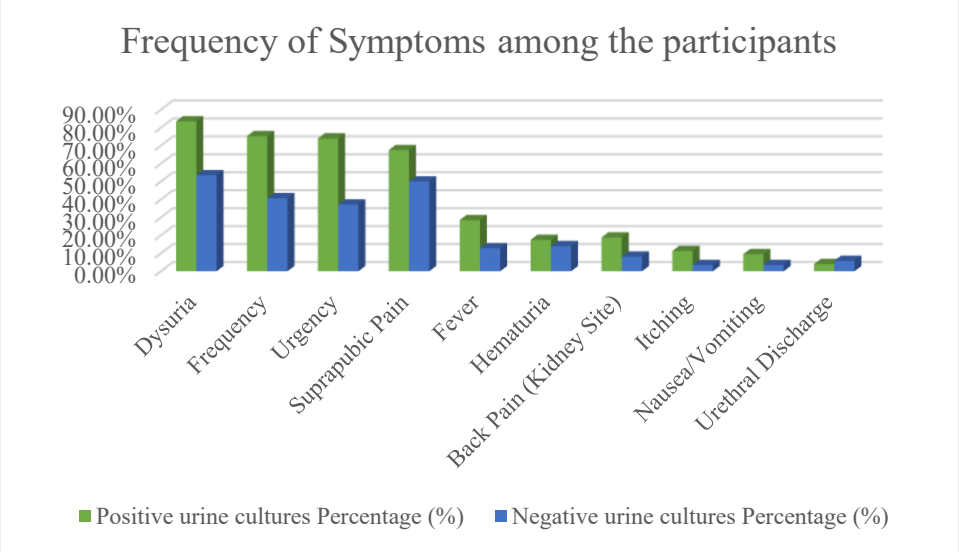

FIGURE 2. Frequency of signs and symptoms among the participants.

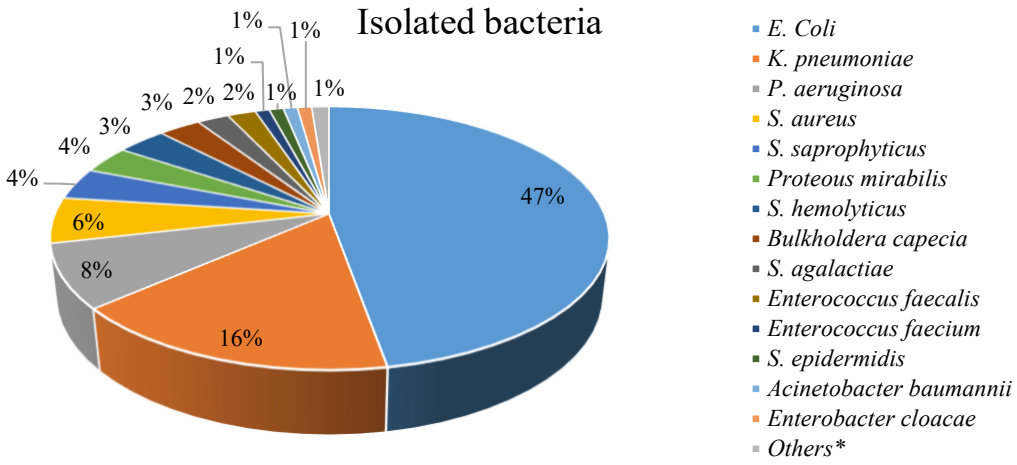

FIGURE 3. Frequency of bacteria isolated from 401 patients with UTI.

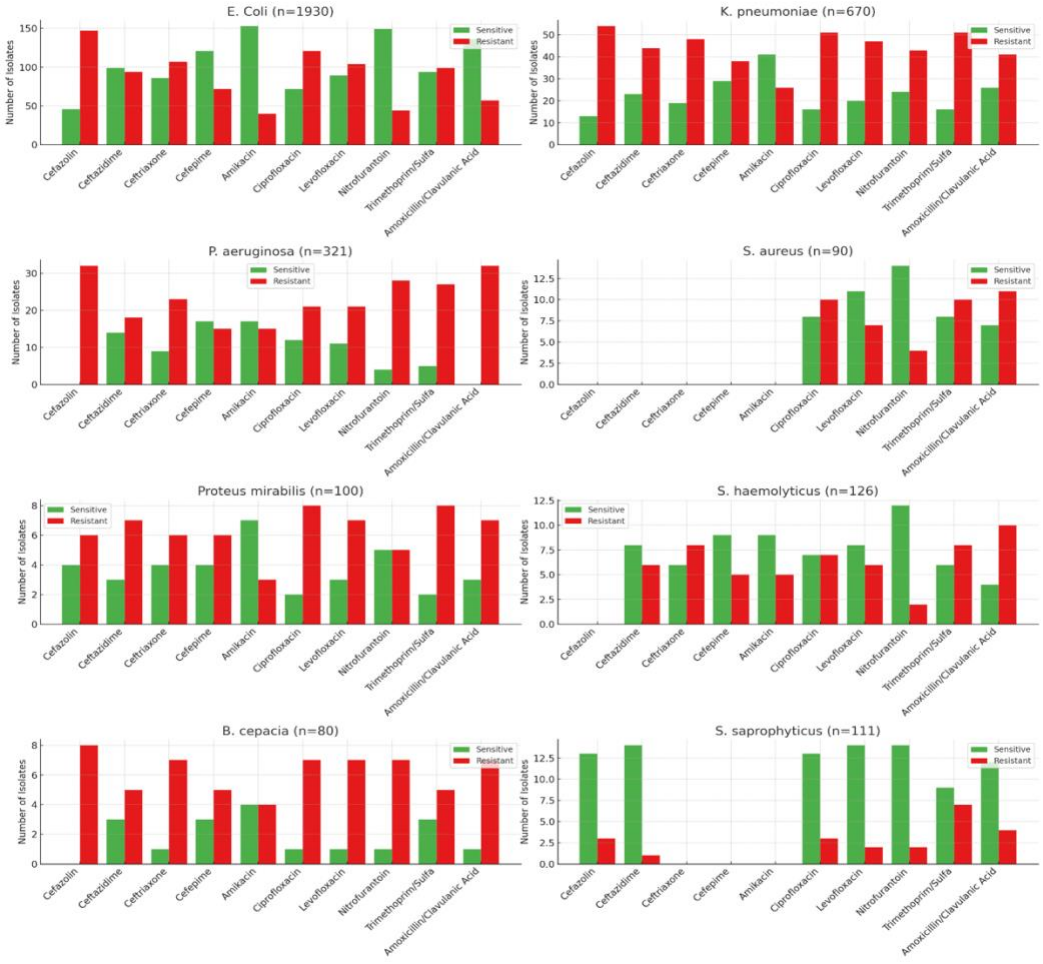

FIGURE 4. Antimicrobial susceptibility profile of most frequently isolated bacteria.