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Original article

Urinary Tract Infections in Elderly Patients in Tripoli, Libya: A Study on Bacterial Isolation and Antimicrobial Susceptibility

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Abstract
Urinary tract infections (UTIs) are considered the most widespread bacterial infections and among the most common nosocomial infections, second only to lower respiratory tract infections. The risk of developing a UTI increases with age, making UTIs among the most commonly diagnosed infections in elderly people, representing a significant public health problem. This study aimed to isolate and detect the microbial responsible for urinary tract infections in elderly individuals and determine their resistance patterns and sensitivity to antibiotics among Libyan patients in Tripoli city. The study was conducted simultaneously in Alsharik, Eltafoq, and Ibn Al Nafis laboratories in Tripoli, Libya, during July and August 2024. One hundred and one urine samples were collected from elderly participants suffering from UTI symptoms (38 males and 63 females), with ages ranging from 60 to 97 years. Isolation, biochemical identification, and antibiotic susceptibility analyses were performed. Thirteen antibiotics were tested in this study. Among the 101 isolated samples from elderly patients with suspected UTI, females had a higher prevalence of bacterial infections (62.4%) compared to males (37.6%). The highest number of infections was in the 60–69 years age group (45.4%). Gram-negative organisms accounted for 91.1% of isolates compared to Gram-positive organisms. Escherichia coli was the most common organism isolated (43.6%), followed by Klebsiella pneumoniae (29.7%). Most isolates were resistant to Ampicillin (31.7%) and Amoxicillin (23.8%), followed by Tetracycline (10.9%). The Gram-positive organisms Streptococcus pneumoniae, Enterobacter spp., and Staphylococcus aureus were most susceptible to Amoxicillin, Amikacin, and Meropenem, with sensitivity rates of 75%, 66.7%, and 50%, respectively. E. coli was more susceptible to Imipenem (25%), Amikacin (22.7%), and Nitrofurantoin (13.6%), whereas Amoxicillin and Sulfamethoxazole/Trimethoprim showed lower efficacy. Gram-negative bacteria were the main cause of UTIs in the study population, mainly belonging to the E. coli and Klebsiella families. Age and gender were significant factors in determining UTI etiology, and considering these factors can improve the accuracy in identifying causative uropathogens and guide empirical treatment.
***Keywords**: UTI, Antibiotic Resistance, Sensitivity Antibiotics, Uropathogenic E. Coli.*

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Introduction

Urinary tract infection (UTI) encompasses a spectrum of infectious syndromes affecting the urinary tract, from the urethra to the kidneys [1]. UTIs represent a significant public health concern and are a major cause of morbidity and mortality worldwide [2, 3]. They are ranked as the second most prevalent form of infection after respiratory tract infections, leading to increased consumption of antimicrobial drugs due to the continuous rise in their incidence [4]. Globally, between 150 and 250 million cases of UTIs are reported each year [5]. UTIs may involve multiple anatomical locations and are classified as either upper urinary tract infections (affecting the kidneys and ureters) or lower urinary tract infections (affecting the bladder, urethra, and vagina), with distinct clinical symptoms such as fever, dysuria, urgency, burning sensation, and intermittent urination [6]. Uncomplicated UTIs typically occur in otherwise healthy individuals without anatomical or neurological abnormalities of the urinary tract and significant comorbidities [7,8,9]. These infections are categorized into lower UTIs (cystitis) and upper UTIs (pyelonephritis) [10,11]. Uncomplicated UTIs, often referred to as cystitis, are linked to several risk factors including female gender, a history of infection, sexual activity, vaginal infections, diabetes, obesity, and genetic predisposition [11, 12]. In contrast, complicated UTIs are associated with conditions that impair urinary tract function or host defenses, such as urinary obstruction, urinary retention due to neurological disease, immunosuppression, renal failure, renal transplantation, pregnancy, or the presence of foreign bodies like calculi, indwelling catheters, or drainage devices [12,13].

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The bacteria are the most common cause of UTIs, although fungi and viruses can occasionally be implicated. Bacterial UTIs typically result from pathogens migrating upward through the genital tract into the bladder, urethra, or kidneys, with the vaginal, perineal, and rectal areas serving as primary sources [6, 13]. UTIs are known to cause short-term morbidity, characterized by fever, dysuria, and lower abdominal pain, and can result in permanent kidney scarring if left untreated [2]. Escherichia coli causes the majority of UTIs, followed by Klebsiella pneumoniae [7]. Other causative agents include Staphylococcus saprophyticus, Pseudomonas aeruginosa, Proteus, Enterobacter, and Enterococcus species [7, 14, 15]. UTIs are categorized based on the setting in which they occur: Nosocomial UTIs (N-UTIs): Infections that develop after 48 hours of hospital admission or within three days post-discharge, commonly caused by E. coli, P. aeruginosa, and Proteus species [16]. Community-acquired UTIs (CA-UTIs): Infections that occur in the general population, most often caused by Klebsiella pneumoniae, Proteus mirabilis, and Staphylococcus saprophyticus [2].
Several risk factors are associated with recurrent UTIs, including gender, age, race, lack of circumcision [17], history of infections, sexual activity, vaginal infections, genetic vulnerability [18], HIV infection [19], diabetes, use of urinary catheters, and structural abnormalities of the genitourinary tract [20]. Pregnancy, breastfeeding, and hospitalization also increase risk [21, 22]. The prevalence of UTIs decreases during middle age but rises significantly in older adults [23]. The incidence of UTIs in individuals over 85 years is approximately 0.13 and 0.08 per person-year for women and men, respectively [24]. In the elderly, UTIs often occur due to age-related factors such as malnutrition, uncontrolled diabetes mellitus, poor bladder control, vaginal atrophy, and prostatic hyperplasia [25, 26, 27]. Across all age groups, women have a higher incidence of UTIs compared to men [28], with 50%-60% of women experiencing at least one UTI during their lifetime [1]. Among sexually active young women, the reported incidence rate of UTIs ranges from 0.5 to 0.7 per woman-year [28], while it is about 0.01 per man-year in young men [29]. Over 10% of women older than 65 years' experience a UTI annually [30], and this number rises to nearly 30% among women over 85 years [31]. The incidence of UTIs in men aged 65–74 years is estimated to increase to about 0.05 per man-year [32].
UTIs in elderly individuals can be caused by a variety of bacteria, including Gram-positive species (Staphylococcus aureus, Enterococcus spp.) and Gram-negative species (Pseudomonas aeruginosa, Enterobacter, Proteus mirabilis, E. coli, Klebsiella pneumoniae) [33]. Treatment of bacterial UTIs largely relies on antibiotics, with broad-spectrum antibiotics often used empirically [34, 14]. However, adverse drug reactions (ADRs), patient complexity, and the rise of multidrug-resistant (MDR) bacterial strains due to the widespread and often unnecessary use of antibiotics pose significant challenges [35, 1]. Purpose of the Study: This study aims to identify the predominant microorganisms responsible for UTIs in elderly Libyan patients and to assess their patterns of antibiotic sensitivity.

Methods

Study settings and population

This cross-sectional study was conducted simultaneously in Alsharik, Eltafoq, and Ibn Al Nafis laboratories in Tripoli, Libya, during the period of July and August 2024. A total of 101 urine samples were collected from elderly participants suffering from UTI symptoms (38 males and 63 females), with ages ranging from 60 to 97 years. All participants provided informed consent to participate in the study. Patients who did not provide consent, women who were menstruating, and individuals who had taken antibiotics within two weeks prior to sample collection were excluded from the study.

Sample collection and processing

Aseptically collected five ml of clean catch midstream urine samples from 101 elderly patients in sterile plastic disposable wide-neck and leak-proof containers. All containers were labeled and transported as soon as possible to the microbiology laboratory, where they had been examined and cultured.

Isolation and biochemical identification

The urine samples were cultured on blood agar and MacConkey agar by using a sterile loop and then incubated at 37°C for 24 hours for bacterial growth. The isolates were identified and differentiated based on colony morphology, Gram staining, and some biochemical tests: the coagulase test and the oxidase test. In addition, the Becton Dickinson Phoenix M50 device was used to identify which type of bacteria it is because of its high accuracy and time-saving features.

Antibiotic Susceptibility Test

All 101 bacterial isolates were subjected to antibiotic susceptibility testing using the Becton Dickinson Phoenix™ M50 system.

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Statistical Analysis

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 26.0. Descriptive statistics were used to summarize the data. The chi-square test was employed to evaluate categorical variables. A p-value less than 0.05 was considered statistically significant.

Results

Evaluation of the frequency of UTI

Out of 101 elderly patients with suspected UTIs, 38 (37.6%) were male and 63 (62.4%) were female. The highest number of cases was observed in the age group 60–69 years (45.4%), followed by 70–79 years (33.7%). Regarding age distribution, no statistically significant difference was found among the groups (p = 0.086), as shown in Table 1.

Table 1. Distribution of UTI patients across different age groups and genders.

Age Groups (In years)	Gender n (%)		Total	P-value
	Male	Female		
60-69	20 (19.8%)	26 (25.7%)	46 (45.4%)	0.086
70-79	9 (8.9%)	25 (24.8%)	34 (33.7%)	
80-89	5 (5.0%)	11 (10.9%)	16 (15.8%)	
90+	4 (4.0%)	1 (1.0%)	5 (5.0%)	
Total	38 (37.6%)	63 (62.4%)	101 (100.0%)	

Regarding the prevalence of organisms in UTI patients, out of 101 isolates sample, were 9 (8.9%) isolates belonged to gram positive organisms and 92 (91.1%) gram negative organisms. Among 9-gram positive isolates, Staphylococcus aureus and Streptococcus pneumoniae represented each 4 (4.0%), which was the most common organism isolated, followed by Enterococcus faecalis (1.0%). Among 92-gram negative isolates, E. coli 44 (43.6%) was the most common organism isolated, followed by K. pneumoniae 30 (29.7%), as shown in Table 2.

Table 2. Most prevalent organisms in Urinary tract infections in the study population

Bacteria	Frequency	Percentage
Escherichia coli	44	43.6%
Klebsiella pneumoniae	30	29.7%
Proteus mirabilis	6	5.9%
Pseudomonas aeruginosa	5	5.0%
Staphylococcus aureus	4	4.0%
Streptococcus pneumoniae	4	4.0%
Citrobacter spp.	3	3.0%
Enterobacter spp.	3	3.0%
Enterococcus faecalis	1	1.0%
Klebsiellaoxytoca	1	1.0%
Total	101	100%

Among the tested specimens, the antimicrobial susceptibility patterns of 101 bacterial samples isolated from patients with UTI, this table displays that most of the isolates were resistant to Ampicillin 32 (31.7%) and Amoxicillin 24 (23.8%), followed by Tetracycline 11 (10.9%), Vancomycin 8 (7.9%), Sulfamethoxazole/Trimethoprim 7 (6.9%), Nitrofurantoin 6 (5.9%), Ceftazidime, and Kanamycin (5.0%). Overall, no statistically significant association between the variables (p = 0.255), as shown in the table 3.

Table 3. Chi square test for resistance pattern of the antibiotics among UTI patients

Bacteria	Antibiotic											Total
	AK 30µg	AML 25µg	AMP 10µg	CAZ 30µg	DO 30µg	K 24µg	MEM 10µg	NIT F,300 µg	SXT 5µg	TE 30µg	VA 30µg	
E.coli	(0) 0.0%	(13) 29.5%	(12) 27.3%	(4) 9.1%	(1) 2.3%	(0) 0.0%	(1) 2.3%	(0) 0.0%	(5) 11.4 %	(2) 4.5%	(6) 13.6 %	(44) 100%

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Klebsiella pneumoniae	(1) 3.3%	(2) 6.7%	(14) 46.7%	(0) 0.0%	(0) 0.0%	(4) 13.3%	(0) 0.0%	(4) 13.3 %	(2) 6.7%	(2) 6.7%	(1) 3.3%	(30) 100%
Proteus mirabilis	(0) 0.0%	(4) 66.7%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0%	(2) 33.3 %	(0) 0.0%	(6) 100%
P.aureginosa	(0) 0.0%	(2) 40.0%	(0) 0.0%	(0) 0 .0%	(0) 0.0%	(1) 0.0%	(0) 0.0%	(2) 40.0 %	(0) 0.0%	(0) 0.0%	(0) 0.0%	(5) 100%
S.aureus	(0) 0.0%	(2) 50.0%	(1) 25.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(1) 5.0%	(0) 0.0%	(4) 100%
S.pneumoniae	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(3) 75.0 %	(1) 25.0 %	(4) 100%
Citrobacter spp.	(0) 0.0%	(0) 0.0%	(3) 100%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(3) 100%
Enterobacter spp.	(0) 0.0%	(0) 0.0%	(1) 33.3%	(1) 33.3%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(1) 33.3 %	(0) 0.0%	(0) 0.0%
E.faecalis	(0) 0.0%	(1) 100%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(1) 100%
Klebsiellaoxytoca	(0) 0.0%	(0) 0.0%	(1) 100%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(1) 100%
Total	(1) 1.0%	(24) 23.8%	(32) 31.7%	(5) 5.0%	(1) 1.0%	(5) 5.0%	(1) 1.0%	(6) 5.9%	(7) 6.9%	(11) 10.9 %	(8) 7.9%	(101) 100%

** Chi square test; P-value for comparing the g case and control study groups was 0.395. Abbreviations :(AK) Amikacin, (AML) Amoxicillin, (AMP) Ampicillin, (CAZ) Ceftazidime, (DO) Doxycycline, (K) Kanamycin, (MEM) Meropenem, (NIT) Nitrofurantoin, (SXT) Sulfamethoxazole/ Trimethoprim, (TE) Tetracycline, (VA) Vancomycin, (TBR) Tobramycin, (IPM) Imipenem*: Statistically significant at p ≤ 0.05*

The findings in Table 4 display the sensitivity pattern of antibiotics against various bacterial species. The gram-positive organisms S. pneumoniae, Enterobacter spp., and S. aureus were most susceptible to amoxicillin, amikacin, and meropenem, with a sensitivity rate of 75%, 66.7%, and 50%, respectively. While the sensitivity pattern of antibiotics against gram-negative is varies according to species. For example, E. coli was more susceptible to: imipenem (25%), amikacin (22.7%), nitrofurantoin (13.6%), ceftazidime (9.1%), doxycycline, meropenem, and tobramycin (6.8%). Amoxicillin and sulfamethoxazole/trimethoprim, on the other hand, had lower efficacy rates. About K. pneumoniae, the following patterns of antibiotic sensitivity were observed: 30% for imipenem, 20% for ceftazidime, and 20% for Tobramycin. P. mirabilis responded well to ceftazidime as well. Both meropenem and amoxicillin have shown a 40.0% susceptibility rate in P. aeruginosa. Overall, no significant association between variables (p-value =0.395).

Table 4. Sensitivity pattern of the antibiotics against bacterial UTI infection

Bacteria	Antibiotic											
	AK 30µg	AML 25µg	CAZ 30µg	DO 30µg	IPM 10µg	K 24µg	MEM 10µg	NITF,300 µg	SXT 5µg	TBR 10µg	VAN 30µg	Total
E.coli	(10) 22.7%	(1) 2.3%	(4) 9.1%	(3) 6.8%	(11) 25.0%	(2) 2.3%	(3) 6.8%	(6) 13.6%	(1) 2.3%	(3) 6.8%	(0) 0.0%	(44) 100%
K. Pneumoniae	(3) 10.0%	(0) 0.0%	(6) 20.0%	(0) 0.0%	(9) 30.0%	(0) 0.0%	(3) 10.0%	(1) 3.3%	(2) 6.7%	(6) 20.0%	(0) 0.0%	(30) 100%
Proteus mirabilis	(0) 0.0%	(0) 0.0%	(5) 83.3%	(0) 0.0%	(1) 16.7%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(6) 100%
P.aureginosa	(0) 0.0%	(2) 40.0%	(0) 0.0%	(0) 0.0%	(1) 20.0%	(0) 0.0%	(2) 40.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(5) 100%
S.aureus	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(2) 50.0%	(0) 0.0%	(1) 25.0 %	(0) 0.0%	(1) 25.0 %	(4) 100%
S.pneumoniae	(0) 0.0%	(3) 75.0%	(0) 0.0%	(0) 0.0%	(1) 25.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(4) 100%

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Citrobacter spp.	(2) 66.7%	(0) 0.0%	(1) 33.3%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(3) 100%
Enterobacter spp.	(2) 66.7%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(1) 33.3%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(3) 100%
E.faecalis	(0) 0.0%	(0) 0.0%	(0) 0.0%	(1) 100%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(1) 100%
Klebsiella oxytoca	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(1) 100%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(0) 0.0%	(1) 100%
Total	(18) 17.8%	(4) 4.0%	(18) 17.8%	(4) 4.0%	(24) 23.8%	(2) 2.0%	(10) 9.9%	(7) 6.9%	(4) 4.0%	(9) 8.9%	(1) 1.0%	(101) 100%

** Chi square test; P-value for comparing FBS among case and control study groups was 0.395. Abbreviations :(AK) Amikacin, (AML) Amoxicillin, (AMP) Ampicillin, (CAZ) Ceftazidime, (DO) Doxycycline, (K) Kanamycin, (MEM) Meropenem, (NIT) Nitrofurantoin, (SXT) Sulfamethoxazole/Trimethoprim, (TE) Tetracycline, (VA) Vancomycin, (TBR) Tobramycin, (IPM) Imipenem. *: Statistically significant at p ≤ 0.05*

Discussion

Urinary tract infection (UTI) is one of the most commonly diagnosed infections in older adults, ranking second only to respiratory infections in patients over the age of 65 years [36, 37]. Age-related risk factors contribute significantly to the high incidence of UTIs, with UTIs accounting for around 25% of all geriatric hospitalizations and approximately 6.2% of deaths yearly in this age group due to infectious diseases related to UTIs [25, 27]. Unlike in younger adults, UTIs and asymptomatic bacteriuria are highly prevalent among older individuals [36, 37]. While UTIs in younger adults typically present with localized symptoms such as painful urination, urinary urgency, frequency, and suprapubic pain, symptoms in the elderly are often atypical. They may include delirium, confusion, dizziness, drowsiness, falls, urinary incontinence, or poor appetite — often in the absence of fever — making diagnosis more challenging as elderly patients may not clearly report urinary symptoms [25, 38].

The current investigation in Table 1 looked distribution of the prevalence of UTI among older adults across different age groups and genders. Of study population was female, and they had a higher prevalence rate of UTI (62.4%) compared to males (37.6%). This significantly agrees with a study in the USA [39], which concluded that overall, females the more likely to be patients with UTIs to have UTIs than males (69.1%) than males (22.4%) at males. This is because during pregnancy, it becomes easier to get a UTI, the drainage system from the kidney to the bladder widens, so urine does not drain as quickly. Considering to anatomical differences in the urinary tract in men and women, older women are more prone to UTIs than older men. This is in agreement with recent studies conducted in America [1], which have shown that postmenopausal women who have used complicated contraceptives are especially prone to recurrent UTIs. As, the recently study (40), conducted on function of the postmenopausal urogenital microbiomethis in elderly females, detected that lack of estrogenization of vaginal tissues and lower urinary tracts, leads to adverse changes in urogenital epithelium, which causes incidence of atrophic vaginitis and vaginal urogenital microbiome. Chronic conditions as diabetes, some medications, and problems with incontinence put older people at an increased risk for developing UTIs [39]. Its symptoms may appear in the first stage of aging in males, especially since it is associated (rUTIs) with prostate diseases, as recurrent urinary tract infections are one of the complications that may occur due to acute bacterial prostatitis, as uncomplicated infections occur, often related to sexual activity, most of them caused by Gram-negative bacilli (41). For that, the highest number in this study was in the age group (60-69) years, where males constituted 19.8% and females 25.7%, with a total of 45.4%. Compared by the age group (70-79) with a percentage of (33.7%), males constituted (8.9%), in contrast to (24.8%) of females. So, the elderly men are more likely to get UTIs versus the younger men, especially in early aging, because of the acute bacterial prostatitis (rUTIs) and trouble with urine flow that is related to sexual activity [39,41]. In general, this is somewhat consistent with the results study [42], where the highest prevalence rate of 58% at subjects aged ≥60 years old and more. Our result research in tab. 2, figure (2), indicating mainly on Gram-negative bacteria as main cause in UTI patients, with (91.1%), while Gram-positive bacteria made up only (8.9%) of isolated samples, as stated in previously study, that most of recurrent urinary tract infections related to chronic bacterial prostatitis were caused by Gram-negative bacilli (41), as reported in study (43).

The organisms causing bacteriuria could be due to host gastrointestinal tract flora that colonizes peri-urethral (endogenous causes) or caused by contamination (exogenous causes) [44]. Escherichia coli (E. coli) is part of commensal intestinal flora, the most common gram-negative bacteria in the human gastrointestinal tract; however, it is found outside of the intestinal tract, causing urinary tract infections (UTI), pneumonia, bacteriuria, bacteremia, and peritonitis [45]. In these findings, Escherichia coli (E. coli)

isolates were the predominant pathogen in UTI, representing 43.6% of isolated samples, while Klebsiella pneumoniae was 29.7%, then Proteus mirabilis with 5.9%, and Pseudomonas aeruginosa with 5.0%. This agrees greatly with a recent study [44], which refers to the most commonly isolated organisms being gram-negative bacteria, with Escherichia coli and Klebsiella spp, for (62.2%), (27.0%), respectively. As well consistent with a study in Italy [40] found that overall Escherichia coli accounted for 67.6% of isolates, followed by Klebsiella pneumoniae (8.8%), Proteus mirabilis (5.2%), and Pseudomonas aeruginosa (2.5%). Also, consistent with the study [11], which found that uropathogenic Escherichia coli (UPEC) causes the vast majority of bladder infections. This may be attributed to when UPEC enters the lower urinary tract, bypassing the epithelium (urothelium) barrier, and forms intracellular bacterial communities (IBCs), in the urinary system. Also, a study [46] was carried out in 2023, concluding that the uropathogenic E. coli (UPEC) is the most common causative agent in both uncomplicated and complicated UTIs. Which own many tactics in adaptive evolution in uropathogenic infection, including changes in colonization, attachment, invasion, and intracellular replication to invade the urothelium and survive intracellularly.
The antibiotic resistance pattern of the antibiotics among UTI patients in Table 3 displays the antimicrobial susceptibility of isolates, samples were highest resistance to Ampicillin (31.7%) and Amoxicillin (23.8%), then by Tetracycline (10.9%). While we were below resistance with Vancomycin (7.9%), Sulfamethoxazole/Trimethoprim (6.9%), Nitrofurantoin (5.9%), Ceftazidime, and Kanamycin (5.0%). This is consistent with a recent study [35] conducted in Uganda, which reported that the highest resistance rates were observed for amoxicillin and ciprofloxacin (66.2% and 44.6%, respectively). As well, consistent with the study [43], which concluded that UPEC isolates showed the highest resistance to Ampicillin, tetracycline, and amoxicillin. The antibiotic sensitivity assays in Table 4 showed a variety of sensitivity antibiotics against bacterial UTI infection in isolated samples, where the gram-negative (E. coli) was more susceptible to: imipenem (25%), amikacin (22.7%). Then, nitrofurantoin just by (13.6%). This is not consistent with the study [47], were a significantly high degree of sensitivity rates to nitrofurantoin with (96.4%), also the study [35] that found Nitrofurantoin was the most effective drug (87.3%), followed by imipenem (74.5%). As well as, not in agreement with study (44), which concluded the sensitivity to antibiotics of Nitrofurantoin was the highest by (64.3%), whereas the imipenem was lowest (2.9%).

Conclusion

Diagnosing and treating urinary tract infections (UTIs) in elderly patients is more challenging than in younger populations. Early detection is essential to reduce morbidity and mortality associated with UTIs in older adults. Our findings highlight that Gram-negative bacteria, especially Escherichia coli and Klebsiella pneumoniae, are the predominant pathogens causing UTIs in the elderly population of Tripoli, Libya. The emergence of antimicrobial resistance among uropathogens may compromise treatment outcomes, leading to more virulent, persistent, and treatment-resistant infections. Preventive strategies and appropriate empiric antibiotic selection based on local susceptibility patterns are critical for improving clinical outcomes in elderly patients.

Conflict of Interest

Nil

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