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Original Research article

Prevalence and antimicrobial resistance properties of Extended-spectrum beta-lactamases (ESBL) producing *Escherichia coli* isolated from the cases of Urinary Tract Infections

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Running title: Extended-spectrum beta-lactamases producing *Escherichia coli* in UTIs.

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Abstract

Background and objectives: Extended-Spectrum Beta-Lactamase (ESBL) producing *Escherichia coli* is the most prevalent cause of Urinary Tract Infections (UTIs). The present research was done to study the prevalence and antibiotic resistance properties of ESBL and non-ESBL producing *Escherichia coli* strains isolated from the cases of UTIs. **Materials and methods:** Five-hundred and one urine samples were collected and cultured for *E. coli*. Positive samples were analyzed for presence of ESBL. Antibiotic resistance pattern of strains was analyzed using disk diffusion method. **Results:** Three-hundred and twenty-seven out of 501 (65.26%) urine specimens were positive for *E. coli*. Older than 40 years male (65.21%) and also younger than 20 years female (96.77%) had the highest prevalence of *E. coli*. Prevalence of ESBL and non-ESBL producing strains were 15.29% and 84.70%, respectively. ESBL *E. coli* harbored the highest prevalence of resistance against ampicillin (100%), ceftriaxone (100%), cefalexin (98%) and piperacillin (96%). Non-ESBL *E. coli* strains harbored the highest prevalence of resistance against ciprofloxacin (76.89%), ampicillin (72.92%) and gentamicin (68.95%). **Conclusion:** Imipenem, nitrofurantoin and tobramycin had good activity against both ESBL and non-ESBL producing *E. coli* strains. Further researches are required to found other epidemiological aspects of ESBL and non-ESBL producing *E. coli* strains isolated from UTIs.

Keywords: Extended-Spectrum Beta-Lactamase, *Escherichia coli*, Antibiotic resistance, Urinary Tract Infections.

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1. Introduction

Urinary Tract Infections (UTIs) are one of the most prevalent bacterial infections, accounting for about 25% of all infections in women (1-3). It is an infection in any part of the urinary tract including ureters, kidneys, bladder and urethra (1-3). UTIs can also lead to other severe syndromes including cystitis, urethritis and pyelonephritis (1-3). The average prevalence rate of UTIs in boys and girls are about 2% and 5-10%, respectively (1-3). Documented data revealed that about 80% of females had experience of the UTIs in their life (1-4).

Clinical and epidemiological researches revealed that the Uropathogenic *Escherichia coli* (*E. coli* (UPEC)) strains are the most common cause of the UTIs all-around the world (1-4). It has been assessed that the UPEC strains are responsible for about 70-90% of cases of UTIs in children and also 50-100% of cases in women (1-4). It is a Gram-negative, rod shape and facultative aerobic bacterium of the Enterobacteriaceae family with an emergence of antibiotic resistance (1-4).

Production of β-lactamases is an important way for occurrence of antibiotic resistance in Gram-negative bacteria and especially *E. coli* strains (5-7). This pathway is mainly causes resistance against Beta (β)-lactam antibiotics (5-7). The growing prevalence of *E. coli* strains producing Extended-Spectrum-β-Lactamases (ESBLs) is presented in hospitals (5-7). Infections with ESBL producing UPEC strains are associated with higher rates of mortality, morbidity and healthcare expenditure (5-8). The mortality rate of the UTIs caused by the ESBL producing UPEC strains have ranged from 30-100% (5-8).

The ESBL‑producing *E. coli* strains are particularly resist against all penicillins, cephalosporins (especially third and fourth generations), and to aztreonam (5-10). They also have cross‑resistance to trimethoprim/sulfamethoxazole and quinolones antibiotics (5-10). Documented data and also results of the epidemiological studies showed that the ESBL producing *E. coli* strains are mainly associated with occurrence of resistance against other types of antibiotics such as fluoroquinolone, tetracyclines and aminoglycoside (5-10). This combination of properties can potentially affect the course and outcomes of UTIs. Therefore, further studies are required to found additional epidemiological aspects of ESBL and non-ESBL producing UPEC strains both in the community and in the hospital setting (9, 10).

Data on the prevalence and antibiotic resistance pattern of the ESBL producing UPEC strains are scarce in Iran. Therefore, the present investigation was done to study the prevalence rate and antibiotic resistance pattern of the ESBL and non-ESBL producing UPEC strains isolated from the cases of UTIs in Iran.

2. Materials and methods

Ethical consideration

The current research was performed on the male and female outpatients suffered from UITs referred to the Fardis Medical Laboratory (Alborz, Iran). Specimens were taken from the patients who were volunteered for this study. Written informed consent was also obtained from all of the study patients or their parents.

Samples

From May 2016 to July 2017, a total of 501 urine samples were collected from outpatients suffered from UTIs referred to the Fardis Medicinal Diagnostic Laboratory (Alborz, Iran). The ultrasound device was used for confirmation of the UTIs in outpatients (11). Urine specimens were collected from male (n= 79) and female (n= 422) outpatients. Collected urine specimens were divided based on the age of outpatients into three different groups (<20 years, 20-40 years

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and >40 years). All urine specimens were obtained from the Fardis Medicinal Diagnostic Laboratory (Alborz, Iran). Midstream urine was collected in sterile condition to decrease potential bacterial, cellular and artifactual contamination. All tests were performed on the Fardis Medicinal Diagnostic Laboratory (Alborz, Iran).

E. coli isolation and identification

Five microliters of each sample was blended with 225 mL of nutrient broth (Merck, Germany) for 2 min at normal speed, using a Stomacher lab blender and incubated at 37 °C for 24 h. One milliliter sample of the nutrient broth culture was mixed with 9 mL of MacConkey broth (Merck, Germany) and further incubated at 37 °C for 24h. One loop of each tube was streaked on MacConkey agar (Merck, Germany). A typical purple colony of *E. coli* (lactose-positive colony) was streaked on Eosin Methylene Blue agar plate (EMB, Merck, Germany) and incubated at 37 °C for 24 h. A metallic green colony from each plate with typical *E. coli* morphology was selected and examined by biochemical tests, including Triple Sugar Iron agar (TSI, Merck, Germany), Lysine Iron Agar (LIA, Merck, Germany), IMVC (Indole, Methyl-red, Voges-Proskauer (VP) and Citrate utilization), hydrogen sulfide production, and urease tests. *E. coli* isolates were stored in Tryptic Soy Broth (TSB, Merck, Germany) containing 20% glycerol at −70°C for further characterization.

E. coli strains were sub-cultured overnight in Luria-Bertani broth (Merck, Germany) and genomic DNA was extracted from typical colonies of *E. coli* using DNA extraction kit (Fermentas, Germany) according to manufacturer's instruction. All of the positive colonies were confirmed another time using the Polymerase Chain Reaction (PCR)-based amplification of the *16SrRNA* gene (12).

Identification of the ESBL-producing E. coli isolates

Bacterial suspensions with concentration of 1.5×10^8 cfu/ml (0.5 McFarland standard) were prepared. Combination disk method was used for detection of ESBL producing *E. coli* strains. *E. coli* strains were cultured on a Muller-Hinton agar plates (Merck, Germany), then cefotaxim (30 µg), cefotaxim/clavulanic acid (30/10 µg), ceftazidime (30 µg) and ceftazidime/clavulanic acid (30/10 µg) disks (MAST, UK) were placed on media in 25 mm with each other and 16 mm with the walls of plates. The plates were incubated for 18-24 h at 37 °C. ESBLs producing *E. coli* were detected by an at least 5 mm increasing of inhibition zone around the disks contained clavulanic acid than those without clavulanic acid (13).

Antibiotic susceptibility testing of the ESBL and non-ESBL producing E. coli isolates

Pattern of antimicrobial resistance was studied using the simple disk diffusion technique. The Mueller–Hinton agar (Merck, Germany) medium was used for this purpose. Principles of the Clinical and Laboratory Standards Institute (CLSI) guidelines were used for this purpose (13). Antibiotic resistance pattern of the ESBL-producing *E. coli* strains isolated from the urine specimens was assessed against 15 commonly used antibiotic agents including ampicillin (10 u/disk), imipenem (30 u/disk), nalidixic acid (30 µg/disk), cefoxitin (30 u/disk), cefalexin (30 µg/disk), nitrofurantoin (300 µg/disk), cefepime (30 µg/disk), gentamycin (10 µg/disk), cotrimoxazole (30 µg/disk), tetracycline (30 µg/disk), mezlocillin (75 µg/disk), ciprofloxacin (5 µg/disk), piperacillin (30 µg/disk), ceftriaxone (30 µg/disk) and tobramycin (10 µg/disk) (Oxoid, UK). All of the inoculated plates were aerobically incubated at 37 °C for 18-24 h in an aerobic

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atmosphere. Results were interpreted based on the instruction provided by the CLSI (2015) (13). *E. coli* ATCC 25922 was used as quality control organism.

Statistical analysis

Statistical analysis was done using the SPSS 21.0 statistical software (SPSS Inc., Chicago, IL, USA). Chi-square test and Fisher's exact two-tailed test were used to assess any significant relationship between prevalence of ESBL and non-ESBL producing strains and their antibiotic resistance pattern. *P* value <0.05 was considered as statistical significant level.

3. Results

Table 1 represents the distribution of *E. coli* strains and ESBL-positive and negative bacteria isolated from urine specimens of outpatients suffered from UTIs. Three-hundred and twenty-seven out of 501 urine specimens (65.26%) harbored *E. coli*. Prevalence of *E. coli* isolates in urine specimens taken from male and female outpatients were 50.63% and 68.00%, respectively. Older than 40 years old male patients (65.21%) and also younger than 20 years old female patients (96.77%) had the highest prevalence of *E. coli* strains. Statistically significant difference was seen between the prevalence of *E. coli* and sex of patients (*P* <0.05) and also between the prevalence of *E. coli* and age of patients (*P* <0.05). Fifty out of 327 (15.29%) *E. coli* isolates were considered as ESBL producing *E. coli*. Therefore, prevalence of non-ESBL producing *E. coli* strains was 84.70%. Prevalence of ESBL producing *E. coli* strains among male and female outpatients were 12.50% and 15.67%, respectively. Twenty to forty years old male patients (100%) and younger than 20 years old female patients (33.33%) had the highest prevalence of ESBL producing *E. coli* strains. Statistically significant difference was seen between the prevalence of ESBL producing *E. coli* strains and age of patients (*P* <0.05). Prevalence of non-ESBL producing *E. coli* strains in male and female outpatients were 87.50% and 84.32%, respectively. Older than 40 years old male (93.33%) and female (93.15%) patients had the highest prevalence of non-ESBL producing *E. coli* strains.

Table 1. Prevalence of *E. coli* and ESBL-producing *E. coli* strains isolated from urine specimens of outpatients suffered from UTIs.

Type of urine samples (sex & year)		No. samples collected	No. positive samples for *E. coli* (%)	No. positive samples for ESBL-producing *E. col* (%)	No. negative samples for ESBL-producing *E. col* (%)
Male	<20	29	9 (31.03)	2 (22.22)	7 (77.77)
	20-40	4	1 (25)	1 (100)	-
	>40	46	30 (65.21)	2 (6.66)	28 (93.33)
	Total	79	40 (50.63)	5 (12.50)	35 (87.50)
Female	<20	62	60 (96.77)	20 (33.33)	40 (66.66)
	20-40	144	81 (56.25)	15 (18.51)	66 (81.48)
	>40	216	146 (67.59)	10 (6.84)	136 (93.15)
	Total	422	287 (68.00)	45 (15.67)	242 (84.32)
Total		**501**	**327 (65.26)**	**50 (15.29)**	**277 (84.70)**

Table 2 represents the prevalence of antibiotic resistance amongst the ESBL producing *E. coli* strains isolated from urine specimens of outpatients suffered from UTIs. ESBL producing *E. coli*

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strains exhibited the highest prevalence of resistance against ampicillin (100%), ceftriaxone (100%), cefalexin (98%), cefoxitin (96%), piperacillin (96%), cefepime (94%) and mezlocillin (94%). Prevalence of resistance against gentamicin, cotrimoxazole, tetracycline and ciprofloxacin were 78%, 72%, 76% and 82%, respectively. Prevalence of resistance against imipenem (6%), nitrofurantoin (20%) and tobramycin (36%) were lower than other tested antibiotics. Statistically significant difference was seen between the prevalence of antibiotic resistance and sex of patients (P <0.05).

Table 3 represents the prevalence of antibiotic resistance amongst the non-ESBL producing *E. coli* strains isolated from urine specimens of outpatients suffered from UTIs. Non-ESBL producing *E. coli* strains exhibited the highest prevalence of resistance against ciprofloxacin (76.89%), ampicillin (72.92%), gentamicin (68.95%), cotrimoxazole (65.34%) and tetracycline (61.73%). Prevalence of resistance against ceftriaxone, mezlocillin, cephalexin, piperacillin and cefoxitin were 60.28%, 59.56%, 58.12%, 57.76% and 51.62%, respectively. Prevalence of resistance against imipenem (2.88%), nitrofurantoin (17.68%) and tobramycin (29.24%) were lower than other tested antibiotics. Statistically significant difference was seen between the prevalence of antibiotic resistance and sex of patients (P <0.05).

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Table 2. Antibiotic resistance pattern of the ESBL producing *E. coli* strains isolated from urine specimens of outpatients suffered from UTIs.

Type of urine samples (No. ESBL-positive)	Antibiotic resistance pattern (%)														
	Am10*	Imp30	Nlx	Cfx	Cflx	N300	Cfp	Gen	Cot	Mez	Tet30	Cip5	Pip	Cftx	Tob
Male (5)	5 (100)	-	2 (40)	4 (80)	4 (80)	2 (40)	2 (40)	2 (40)	3 (60)	3 (60)	3 (60)	3 (60)	4 (80)	5 (100)	1 (20)
Female (45)	45 (100)	3 (6.66)	29 (64.44)	44 (97.77)	45 (100)	8 (17.77)	45 (100)	37 (82.22)	33 (73.33)	44 (97.77)	35 (77.77)	38 (84.44)	44 (97.77)	45 (100)	17 (37.77)
Total (50)	50 (100)	3 (6)	31 (62)	48 (96)	49 (98)	10 (20)	47 (94)	39 (78)	36 (72)	47 (94)	38 (76)	41 (82)	48 (96)	50 (100)	18 (36)

*Am10: ampicillin (10 u/disk), Imp30: imipenem (30 u/disk), Nlx: nalidixic acid (30 µg/disk), Cfx: cefoxitin (30 u/disk), Cflx: cefalexin (30 µg/disk), N300: nitrofurantoin (300 µg/disk), Cfp: cefepime (30 µg/disk), Gen: gentamycin (10 µg/disk), Cot: cotrimoxazole (30 µg/disk), Mez: mezlocillin (75 µg/disk), Tet30: tetracycline (30 µg/disk), Cip5: ciprofloxacin (5 µg/disk), Pip: piperacillin (30 µg/disk), Cftx: ceftriaxone (30 µg/disk), Tob: tobramycin (10 µg/disk).

Table 3. Antibiotic resistance pattern of the non-ESBL producing *E. coli* strains isolated from urine specimens of outpatients suffered from UTIs.

Type of urine samples (No. ESBL-positive)	Antibiotic resistance pattern (%)														
	Am10*	Imp30	Nlx	Cfx	Cflx	N300	Cfp	Gen	Cot	Mez	Tet30	Cip5	Pip	Cftx	Tob
Male (35)	12 (34.28)	1 (2.85)	5 (14.28)	15 (42.85)	9 (25.71)	3 (8.57)	6 (17.14)	18 (51.42)	11 (31.42)	10 (28.57)	16 (45.71)	21 (60)	7 (20)	16 (45.71)	6 (17.14)
Female (242)	190 (78.51)	7 (2.89)	105 (43.38)	128 (52.89)	152 (62.80)	46 (19.00)	121 (50)	173 (71.48)	170 (70.24)	155 (64.04)	155 (64.04)	192 (79.33)	153 (63.22)	151 (62.39)	75 (30.99)
Total (277)	202 (72.92)	8 (2.88)	110 (39.71)	143 (51.62)	161 (58.12)	49 (17.68)	127 (45.84)	191 (68.95)	181 (65.34)	165 (59.56)	171 (61.73)	213 (76.89)	160 (57.76)	167 (60.28)	81 (29.24)

*Am10: ampicillin (10 u/disk), Imp30: imipenem (30 u/disk), Nlx: nalidixic acid (30 µg/disk), Cfx: cefoxitin (30 u/disk), Cflx: cefalexin (30 µg/disk), N300: nitrofurantoin (300 µg/disk), Cfp: cefepime (30 µg/disk), Gen: gentamycin (10 µg/disk), Cot: cotrimoxazole (30 µg/disk), Mez: mezlocillin (75 µg/disk), Tet30: tetracycline (30 µg/disk), Cip5: ciprofloxacin (5 µg/disk), Pip: piperacillin (30 µg/disk), Cftx: ceftriaxone (30 µg/disk), Tob: tobramycin (10 µg/disk

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4. Discussion

UTIs are one of the most common cause of hospitalization all-around the world. UTIs result in an estimated 7 million office visits, 1 million emergency department visits, and over 100,000 hospitalizations with an associated annual cost of $1.6 billion in the United States on 2011 (14). *E. coli* strains are causative agents for at least 75% of UTIs in women and 35% in children (15). Therefore, both UTIs and UPEC strains should consider as emerging issues in the medical sciences.

The current research was done in order to study the prevalence rate and comparison of the antibiotic resistance pattern of the ESBL and non-ESBL producing UPEC strains isolated from the male and female outpatients suffered from UTIs. We found that the prevalence of *E. coli* strains amongst the urine specimens were 65.26% which was considerable. Prevalence of ESBL and non-ESBL producing strains were 15.29% and 87.50%, respectively.

Urine specimens taken from female patients had the highest prevalence of bacteria. It is maybe because of the relatively short and wide urethra of women which facilitates the transmission, colonization and growth of upstream infections. The role of host factors like changes in normal vaginal flora which may put women at higher risk for UTIs should also consider. Higher prevalence of *E. coli* and also UTIs in women is also may be due to the retrograde ascent of bacteria from the perineum of women. Females are more frequently affected by UTIs due to colonization of urethra with colonic Gram-negative bacteria because of its proximity to anus. This part of our findings are in agreement with those of Momtaz et al. (2013) (Iran) (3), Vollmerhausen et al. (2011) (Australia) (16) and Jadhav et al. (2011) (India) (17). Previous study which was conducted in Iran (4) revealed that prevalence of *E. coli* in urine samples taken from male and female hospitalized patients were 37.50% and 75%, respectively. Wong et al. (2017) (18) reported that prevalence of *E. coli* strains in the urine samples taken from 17-35, 36-50 and 51-64 years old patients were 12.10%, 24.30% and 33.60%, respectively. Shakya et al. (2017) (19) reported that 80.90% of the urine samples collected from hospitalized patients of the Nepal were positive for *E. coli*. Prevalence of *E. coli* strains in <10, 11-20, 21-30, 31-40, 41-50, 51-60, 61-70 and >70 years old patients were 8.50%, 4.38%, 26%, 16.20%, 12.10%, 10.10%, 12.30% and 10.40%, respectively. They showed that 91.70% of strains (33/365) were ESBL producing *E. coli*. They showed that prevalence of ESBL producing *E. coli* strains in the urine specimens taken from male and female patients were 18.20% and 81.80%, respectively. Lower prevalence rate of the ESBL producing *E. coli* strains have been reported from Morocco (1.30%) (20), France (1.10%) (21), Spain (1.40% to 1.70%) (22), Brazil (1.48%) (23) and the United States (3.00%) (24). Chander et al. (2013) (25) reported that the prevalence of ESBL-producing *E. coli* strains in <15, 16-30, 31-45, 46-60 and >60 years old male and female patients suffered from UTIs were 75% and 25%, 9.09% and 90.90%, 44.44% and 55.55%, 50% and 50% and finally 75% and 25%, respectively.

Recognizing ESBL producing *E. coli* is a main trial in clinical settings and, due to the selective pressure caused by heavy use of expanded-spectrum cephalosporins, gaps in effective infection control measures and affinity of these enzymes for different substrates, outbreaks are increasing. Castillo-Tokumori et al. (2017) (26) reported that previous hospitalization (OR 2.92), previous antibiotic use (OR 3.09), previous surgery (OR 2.75), and long-term use of corticosteroids (OR 24.32) were the main risk factors for UTIs caused by the ESBL-producing *E. coli*. Hospitalization are associated with exposure of the patient to the healthcare system, which could

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explain the presence of ESBL-producing and resistant bacteria. Epidemiological surveys found that uncontrolled use of penicillins, cephalosporins and fluoroquinolones groups of antibiotics were the main risk factor for high prevalence of ESBL-producing *E. coli* in the cases of UTIs (27, 28). Using from urinary catheter is another important risk factor for occurrence of UTIs caused by the ESBL-producing *E. coli* strains (26). This matter was applied in majority of outpatients of our study. ESBL-producing *E. coli* strains are frequently found in those hospitals where antibiotic use is frequent and the patients are in critical condition.

There is a paucity of recorded literature on study of ESBL producing *E. coli* strains in the cases of UTIs from Iran. To the best of our knowledge, the present research is the first report from Iran with an exclusive focus on investigating the current prevalence and comparison of the antimicrobial resistance properties among ESBL and non-ESBL producing *E. coli* strains isolated from male and female outpatients suffered from the UTIs. The observation of ESBL producing *E. coli* isolates in this study is very alarming and this could be attributed to the indiscriminate and widespread use of antibiotics, particularly beta-lactam antibiotics that are sold over the counter in pharmacy shops without doctors' prescription in Iran. This misuse of antibiotics might have contributed to the emergency of ESBL producing isolates.

Result of the present investigation exhibited that the ESBL producing *E. coli* strains were resistant against all types of tested antibiotics and especially ampicillin, ceftriaxone, cefalexin, cefoxitin, piperacillin, cefepime and mezlocillin. Non-ESBL producing *E. coli* strains exhibited lower prevalence of antibiotic resistance. Non-ESBL producing *E. coli* isolates harbored the highest prevalence of resistance against ciprofloxacin, ampicillin, gentamicin, cotrimoxazole and tetracycline. In keeping with this, non-ESBL producing *E. coli* strains were also resistant against eftriaxone, cefalexin, cefoxitin, piperacillin, cefepime and mezlocillin. The observed high prevalence rate of antibiotic resistance is may be due to uncontrolled consumption and consequence of easy access to inefficient and cheap antibiotics. High prevalence rate of antibiotic resistance of non-ESBL producing *E. coli* strains against penicillins and cephalosporins is due to the fact that there are different mechanisms for antibiotic resistance such as the production of *ampC* β-lactamase, metallo-betalactamase and etc. (25-28).

A striking feature in this study was that the quinolones, ciprofloxacin and nalidixic acid demonstrated a high resistance varying from 40% to 82% among ESBL producing *E. coli* isolates. In addition, the ESBL producing *E. coli* isolates had considerable prevalence of resistance against sulfonamides (cotrimoxazole (72%)), aminoglycosides (gentamicin (78%)) and tetracyclines (tetracycline (76%)). These findings have been supported by the previous studies conducted on Nepal (29), Iran (30), USA h (31) and China (32). Anago et al. (2015) (33) reported that the antibiotic resistance patterns of the ESBL and non-ESBL producing *E. coli* strains against amipicillin, imipenem, cefotaxime, ciprofloxacine, gentamicin and cotrimoxazole were 100% and 91%, 3.40% and 0%, 96.50% and 1.80%, 96.50% and 1.80%, 100% and 25.50%, 82.70% and 21.80% and 100% and 78.20%, respectively. The comparative pattern of antibiotic resistance in their study was almost the same as the present study. The comparison between ESBL producing *E. coli* strains and non-ESBL showed that ESBL-producers were significantly more resistant to cephalosporins, penicillins, quinolones, sulfonamides, aminoglycosides and other groups of antibiotics like nitrofurantoin than non-ESBL producers. The genes encoding ESBLs are usually located in transferable plasmids that may also carry other resistance determinants, such as those for resistance to aminoglycosides, tetracyclines, chloramphenicol, sulfonamides, and quinolones. Infectious diseases (34-37) have been considered as potential

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threat for human population. Hus, comprehensive researches should perform to find all epidemiological aspects of these kinds of diseases.

5. Conclusion

The current research reveals the high prevalence of *E. coli* and also ESBL producing *E. coli* strains in the urine specimens taken from the outpatients suffered from UTIs in Iran. Females had the higher prevalence of *E. coli* and also ESBL producing *E. coli* strains, while males had the higher prevalence of non-ESBL producing *E. coli* strains. We found that ESBL producing *E. coli* strains had the higher prevalence of resistance against all tested antibiotic agents than non-ESBL producing strains. Our report supports that carbapenems (imipenem), nitrofurantoin and tobramycin have good activity against ESBL and non-ESBL producing *E. coli* strains. Antibiotics resistance surveillance and the determination of molecular characteristics of ESBL isolates are primordial to ensure the judicious use of antimicrobial drugs. Further researches are required to found other epidemiological aspects of the antibiotic resistance of ESBL and non-ESBL producing *E. coli* strains isolated from urine specimens of patients suffered from UTIs.

Consent for Publication

Written informed consent was obtained from all patients

Conflict of interest

The authors declare no conflict of interest, financial or otherwise.

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