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Detection of the Antibiotic Resistance Pattern in *Escherichia Coli* Isolated from Urinary Tract Infections in Tabriz City

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Abstract

Background: Urinary tract infections are the second most common type of body infection. *E. coli* is the most common cause of urinary tract of infection both sex. This study was done with aim of surveying amount of susceptibility and resistance among strain of *E. coli* that had been isolated from those who refer to the private laboratories in Tabriz city.

Materials and methods: In this cross-sectional study, 2850 *E. coli* collected from urinary tract infections of the patients. These strains were selected using laboratory standard methods and culture-specific. The antibiotic susceptibility testing was performed using Kirby-Bauer disk diffusion method.

Results: The most of sensibility to imipenem were 90%, Nitrofurantoin 87.05%, Amoxicillin 85.27% the most amount for resistant to Ampicillin were 82.95%, Tetracycline 80.1%, Tobramycin 74.25%.

Conclusion: This study showed increased resistance to different antibiotics in *E. coli* that is a serious warning to the treatment of infections caused by this bacterium in the region. Therefore, in order to prevent increased resistance to other antibiotics, it is essential to withhold prescriptions and unessential use of available antibiotics.

Keywords: *Escherichia coli;* Urinary tract infection; Antibiotic resistance

Introduction

Urinary tract infection (UTI) is one of the most common infections in all age groups. Failure to diagnose and treat it in a timely manner can lead to severe complications such as disorders of the urinary tract, blood pressure, Kidney disorders, Uremia and in pregnant women may cause premature labor and even abortion [1]. The frequency of urinary tract infection is more common in women than men so that almost half of all women at least once in their lifetime have experienced urinary infection. Studies have shown in various communities, Gram-negative bacilli are one of the most common etiologic agents of UTI, in these cases; more than 80% of the total urinary tract infection is the case of acute urinary tract infections [2]. Increased risk of UTI in infants, pregnant women, Elderly people, Patients with spinal cord injuries, following the use of urinary catheter, patients with diabetes, Patients with immune deficiency are reported more often [3]. The basis of proper treatment in urinary tract infections is the selection of an appropriate antibiotic with high efficacy and efficacy. Today, antibiotic resistance among pathogen bacteria has become a serious problem [4]. *E. coli* is a natural habitat for humans and animals, but is found in water, soil and even plants [5]. *E. coli* is one of the most common bacterial agents isolated from human infections. The drug resistance of this bacterium is of great importance, especially in patients hospitalized in hospitals. This bacterium is one of the most common microbial causes of urinary tract infections and is responsible for many nosocomial infections such as sepsis, wound infections, gastroenteritis and neonatal meningitis. *E. coli* is one of the opportunistic pathogens in the hospital and is resistant to beta-lactam antibiotics due to the obtaining of plasmids that code for broad-spectrum beta-lactamases. For this reason, the treatment of *E. coli* infections has been difficult [6]. Considering the above, we found that in a large study, determination of *E. coli* caused by urinary tract infection and its antibiotic susceptibility pattern in the city of Tabriz. This will be the basis for future studies and determine the changes in the pattern mentioned over time.

Materials and Methods

In a 12-month period from April 2013 to April 2014, a total of 8709 urinary samples were collected from patients with

urinary tract infection who were referred to private and public medical diagnostic laboratories in Tabriz and the suburbs with clinical symptoms of UTI and cultured on Blood Agar and MacConkey agar media, and after 48 Observation time, and presence of 10^5 colonies per ml of urine as positive culture and biochemical tests such as oxidase, fermentation of sugars, movement, indole, urease, nitric acid, MR, VP, H2S, Simon citrate, amino acid breakdown (Lysine, Arginine, Phenol Alanine and Ornitin) and cultivation in the KIA environment. Subsequently, the antimicrobial susceptibility test was performed according to the standard release method of the disk on the Müller Hinton Agar (German Merck Company), according to the 2007 Instruction of the Clinical and Laboratory Standards Institute (CLSI) and using disks Ceftriaxone (30 µg), Imipenem (10 µg), Nalidixic acid (30 µg), Cotrimoxazole (25 µg), Amikacin (30 µg), Gentamicin (10 µg), Tetracycline (30 µg), Nitrofurantoin (300 µg), Norfloxacin (10 µg), Cotrimoxazole (25 µg), Ampicillin (10 µg), Tobramycin (10 µg), Amoxicillin (10 µg), Ciprofloxacin (5 µg), and Cefotaxime (30 µg) [7,8]. Antibiotic disks used in this test were purchased from Pad Tan Teb Company. For all cases, the sensitivity test of the standard strain of *E. coli* with ATCC No. 25922 was used. Data were analyzed by SPSS 11.5 using descriptive statistics. Patients with a history of recurrent urinary tract infections, those who had taken antibiotics before, or had a history of hospitalization in the past two weeks were not included in the study.

Results

The total number of samples examined was 8709 cases involving 6096 women (70%) and 2613 men (30%). The number of positive culture cases were 5700 (65.4%), which included 4332 women (76%) and 1368 men (24%). After laboratory tests, the most common pathogen was *E. coli,* responsible for 2850 cases (50%) of positive cultures, of which 2280 (80%) were females and 570 (20%) were male **(Figure 1).**

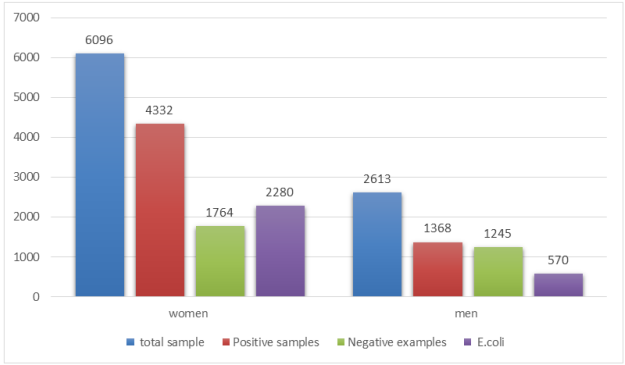

Figure 1 Comparison of frequency distribution of tested strains in both sexes for women and men.

The highest antibiotic susceptibility of *E. coli* was related to imipenem (90%), nitrofurantoin (87.05%) and amoxicillin (85.27%) and the highest resistance to ampicillin (82.95%), tetracycline (80.1%) and tobramycin (74.25%) **(Table 1).**

Table 1 Pattern of susceptibility of strains of *E. coli* strain to antibiotics.

Antibiotics	Anti-Microbial Susceptibility Test		
	Resistant	Intermediate	Sensitive
Cefotaxime	71.58	2.31	26.11
Imipenem	90	2	8
Cefotaxime	71.02	3.02	25.96
Nalidixic Acid	52.95	4.03	43.02
Ampicillin	15.05	2	82.95
Ceftriaxone	56.53	9.47	34
Norfloxacin	66.5	4	29.5
Amikacin	58.35	10	31.65
Gentamicin	38.03	18.95	43.02
Tetracycline	12.95	6.95	80.1
Cotrimoxazole	32.95	3.12	63.93
Ciprofloxacin	71.75	2.14	26.11
Nitrofurantoin	87.05	2.95	10
Amoxicillin	14.03	0.7	85.27
Tobramycin	74.25	2.95	22.8

Discussion

Diagnosis and timely treatment of urinary tract infections, especially in cases of involvement of upper parts of the system are vital, because the delay in the onset of treatment is irreversible damage to renal parenchyma and the occurrence of complications such kidney or kidney abscess, or chronic pyelonephritis. They can sometimes be the cause of chronic renal failure. Considering that because of the lack of an accurate culture of antibiotics in our community, urinary cultures often refer to patients due to previous negative self-treatment. Therefore, in many cases, treatment is based on the most common type of urinary tract infection and its antibiotic susceptibility. Therefore, a general pattern of antibiotic susceptibility to urinary pathogens in any country or even city is needed. In all articles and reference books, *E. coli* has been introduced as the most common cause of urinary tract infection in the community (not hospitals) [9-12]. In a study conducted by Sanchez et al. in the United States to evaluate the antimicrobial resistance of *E. coli* from 2002 to 2010, Resistance to ciprofloxacin has been increased from 3% to 17.1%, and resistance to Cotrimoxazole has risen from 17.9% to 24.2% [13]. In a study published by Mohajeri et al. in Kermanshah in 1390, 200 strains of *E. coli* were studied, 27% of samples were Cefotaxime, 22.5% were samples of

Ceftazidime, and 26% of the samples were resistant to ciprofloxacin. Resistance to samples was 5.62% for Cotrimoxazole and 15% for gentamicin and all were sensitive to Ampicemin and Amikacin [14]. Mobasher Kare Jeddi et al. in Tabriz reported isolate resistance to all antibiotics, with the exception of Imipenem (100% susceptible), more than the present study [15].

Conclusion

According to the results of this study and other studies, and with increasing resistance to various antimicrobial agents such as ciprofloxacin and Imipenem, which are among the therapeutic indices for *E. coli* infections, the need for further studies in this area, as well as reducing the use of antibiotics and their rational administration by physicians, seems necessary.

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Authors Contribution

The authors had equal contributions.

Conflicts of Interest

There are no conflicts of interest.

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