

Antimicrobial susceptibility of *Escherichia coli* isolated from patients with urinary tract infection referred to Imam Ali Hospital Kermanshah, Iran (2011)

Reza Faraji, Fereidoun Sabzi*

Imam Ali Cardiovascular Center, Kermanshah University of Medical Sciences, Kermanshah, Iran
dr_sabzi@yahoo.com

Abstract: Background: A urinary tract infection (UTI) is an infection anywhere in the urinary tract. *Escherichia coli* (*E.coli*) is the most common cause of urinary tract. The aim of this study was carried out to determine the antibiotics susceptibility of *E.coli* isolated from patients with UTI referred to Imam Ali Hospital Kermanshah, Iran (2011). **Materials and Methods:** This descriptive study was performed on 1031 isolates of *E.coli* isolated from patients with UTI in Imam Ali Hospital Kermanshah, Iran (2011). The urine cultures were performed by the streak plates method with blood agar medium and Eosin-Methylene Blue (EMB). The bacterial identification procedures with conventional biochemical tests were performed according to National Committee for Clinical Laboratory Standards (NCCLS) standard tests. Antibiotic susceptibility testing was performed by disk diffusion method. **Results:** Based on the result of antimicrobial testing susceptibility to Ciprofloxacin, Nitrofurantoin, Ceftizoxim, Ceftriaxon, and Ceftazidim were 99%, 83%, 74%, 70%, 66% respectively. Also susceptibility for Amikacin, Gentamycin, Ampicillin, Amoxicillin, Cephalexin, Cephalothin, Nalidixic acid, Co-trimoxazole, and Co-amoxyclove were under 50%. **Discussions:** Antimicrobial resistance pattern is different in each area and it is permanently changing. Ciprofloxacin, Nitrofurantoin, Ceftizoxim, Ceftriaxon, and Ceftazidim are suitable antibiotics for treatment, also Ampicillin and Co-amoxyclove are ineffective on *E. coli*.

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Introduction

Urinary tract infections (UTIs) are a group of infections of the urinary tract. It is the second most common infection in human and a major cause of morbidity and mortality. In the United States, UTIs account for nearly seven million office visits, a million emergency department visits, and one hundred thousand hospitalizations every year (1). The incidence of UTI is in adult women and men of all ages but it occur more commonly in women than men (because, in females, the urethra is much shorter and closer to the anus), so that up to 40% of women will develop UTI at least once during their lives, and a significant number of these women will have recurrent urinary tract infections. Conversely, in males and children, UTI generally reveals a urinary tract lesion that must be identified by imaging and must be treated to suppress the cause of infection and prevent recurrence (2, 3). Most of UTIs (80–85%) are due to *E.coli*. It is a member of the *Enterobacteriaceae* family and normal flora of the gut. *E.coli* is pathogenic bacterium commonly found in various contaminated sources and poses a major health risk (4). According to the importance of this infection, suitable treatment should be done. Treatment is done with antibiotic, but nowadays due to the self-treatment and also widespread use of antibiotic by patients and prescription of antibiotic

without any test to determine the antimicrobial resistance by the physician, it causes the resistance of this infection toward the existing antibiotics and that's why the resistance of antimicrobial becomes an important problem in all over the world, nowadays. So identifying efficient and suitable antibiotic is of great clinical importance (5, 6, and 7). The aim of this study is determining the antibiotics susceptibility of *E. coli* isolated from patients with urinary tract infection referred to Imam Ali Hospital Kermanshah, Iran (2011).

Materials and Methods

This descriptive study was performed on 1825 urine samples patients referred to Imam Ali Hospital Kermanshah, Iran (2011), during 24 months, from January until December 2011.

urine samples were collected in a state of clean catch midstream urine, and stored in laboratory Hospital under refrigeration at 4°C until they were used in experiments.

The urine cultures were immediately performed by the streak plate's method with blood agar medium and EMB. The bacterial growth was assessed after 24–48 h of incubation when indicated. The bacterial identification procedures with conventional biochemical tests (such as: VP and MR, KIA, TSI, SIM, and H₂S) were performed according

to National Committee for Clinical Laboratory Standards (NCCLS) standard tests. The urine culture was considered positive when there was growth of any number of colonies (The growth of more than 10^5 CFU/ml colonies was considered to be positive sample). The susceptibility test to antimicrobials was performed using the disk diffusion method, modified from the Kirby-Bauer method. The reading zone sizes were determined according to the standards provided by the NCCLS. (8,9)

The antibiotic used for the tests included: Ciprofloxacin (30 mcg), Nitrofurantoin (30 mcg), Ceftizoxim (30 mcg), Ceftriaxon (30 mcg), Ceftazidim (30 mcg), Amikacin (30 mcg), Gentamycin (10 mcg), Ampicillin (10 mcg), Amoxicillin (20 mcg), Cephalixin (30 mcg), Cephalothin (30 mcg), Nalidixic acid (30 mcg), Co-trimoxazole (10 mcg), and Co-amoxyclave (30 mcg).

Results

1825 urine samples patients referred to Imam Ali Hospital Kermanshah, Iran (2011) were eligible for this study. Of the 1825 urine samples 1216 of the urine cultures were positive. And of 1216 positive cultures, 1031 cases (85%) were *E.coli*. that, 247 cases (24%) were males and 784 cases (76%) were females. Also 185 cases (15%) were other organism (such as: *Klebsiella sp.*, *Enterococcus*, *Staphylococcus epidermidis*, *Proteus sp.*, and *Enterobacter*, respectively) (Figure 1).

The highest sensitivity rate was for Ciprofloxacin (99%), Nitrofurantoin (83%), Ceftizoxim (74%), Ceftriaxon (70%), and Ceftazidim (66%), respectively. And susceptibility for other antibiotics was under 50%. Also the highest resistance rate was for Ampicillin (90%), Co-amoxyclave (81%), Gentamycin (77%), Amikacin (70%), and Amoxicillin (70%), respectively (Table 1).

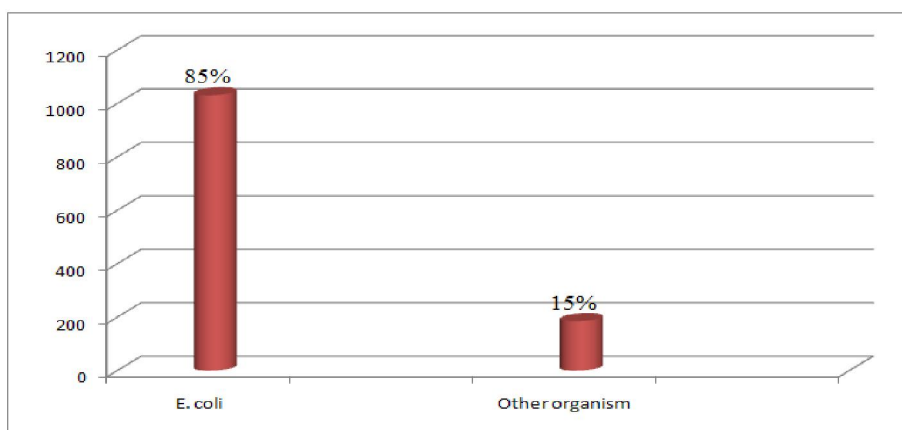


Figure 1. The prevalence rate of *E. coli* in patients with urinary tract infection referred to Imam Ali Hospital Kermanshah, Iran (2011)

Table 1. Antibigram pattern of *E. coli* isolated from urine culture in Imam Ali Hospital Kermanshah, Iran (2011)

Antibiotic	Antibiogram result			
	Sensitive	Intermediate	Resistance	Total
Amikacin	27 (7%)	98 (23%)	296 (70%)	421 (100%)
Gentamycin	48 (11%)	53 (12%)	325 (77%)	426 (100%)
Ampicillin	7 (1%)	48 (9%)	478 (90%)	533 (100%)
Amoxicillin	15 (11%)	27 (5%)	99 (70%)	141 (100%)
Cephalixin	33 (29%)	18 (15%)	64 (56%)	115 (100%)
Cephalothin	23 (23%)	19 (19%)	59 (58%)	101 (100%)
Ceftazidim	307 (66%)	104 (22%)	58 (12%)	469 (100%)
Ceftizoxim	397 (74%)	88 (17%)	48 (9%)	533 (100%)
Ceftriaxon	380 (70%)	79 (15%)	79 (15%)	538 (100%)
Ciprofloxacin	795 (99%)	1 (1%)	-	796 (100%)
Nitrofurantoin	586 (83%)	33 (5%)	88 (12%)	707 (100%)
Nalidixic acid	119 (21%)	201 (36%)	237 (43%)	557 (100%)
Co-trimoxazole	245 (33%)	98 (13%)	398 (54%)	741 (100%)
Co-amoxyclave	3 (3%)	17 (16%)	84 (81%)	104 (100%)

Discussions

UTI due to *E.coli* is highly prevalent. Recently the number of reports upon the resistance to antibiotic discs is rising. Thus the choice of an effective and appropriate drug after diagnosis becomes of utmost importance. The routine method to measure antibiotic sensitivity in bacteria is based on two principles: dilution and diffusion. The disk diffusion agar method is a method based on diffusion alone and can determine the sensitivity or resistance of the bacteria to a specific antibiotic (10,7). In this study, prevalence rate of *E.Coli* based on the disk diffusion method was 85%. In the different performed studies in Iran, Saudi Arabia, North and South America, Europe and the United Kingdom, *E.Coli* have been introduced as the most common cause of UTI and can be due to the high presence of this bacteria in the gut and its adhesion to urethra epithelial cells (11,12,13,14,15). In this study women were infected more than men. In a study which was done by Cetin in the south of Turkey, prevalence rate of infection in women was more than men (16). Also, Farajnia in his own study which was done in several cities in north of Iran, has reported that prevalence rate of *E.Coli* was more in women (11). Cause of this infection in women can be considered by reason of short perineum and closeness of its mouth to the anus. While, the prostatic secretions containing the bactericide substances and Zn, plays a great role in countering with *E.Coli* and causes the prevention of this kind of infection in men (17). Difference of sensitivity rate was significant among the various types of antibiotics used in this study. In this study, maximum rate of sensitivity was observed in *E.Coli* strains to Ciprofloxacin (99%). Like our study, *E.Coli* showed sensitivity to Ciprofloxacin (100%) in the study of Grude which was done in Norway (18). Farrell found Ciprofloxacin as the most effective antibiotic against *E.Coli* in his own study too (19). In this study, Nitrofurantoin with 83% has the highest sensitivity after Ciprofloxacin. Also Like our study, Grude introduced Nitrofurantoin with 97% as the most sensitive antibiotics after Ciprofloxacin (18). The high sensitivity of Ciprofloxacin and Nitrofurantoin is due to the limited use of antibiotics by physicians in the medical system. In this study, third-generation Cephalosporins were stood in third place, based on Antimicrobial sensitivity, after Ciprofloxacin and Nitrofurantoin. So that the sensitivity to Ceftizoxim, Ceftriaxon and Ceftazidim were 74%, 70% and 66% respectively. Matute was estimated the sensitivity to Ceftriaxon in his study which was more than 90% (20). Fluit reported that the most sensitivity are belong to Ceftizoxim and Ceftazidim (more than 70%), based on massive studies on 25 I.C.U in Europe (21). In

spite of influence of third-generation Cephalosporins on UTI of *E. coli*, but, it seems that there's not considerable resistance to these antibiotics. Same as other studies (22, 23), other antibiotics used in this study showed the sensitivity below 50%. So that, Amikacin 7%, Gentamycin 11%, Ampicillin 1%, Amoxicillin 11%, Cephalexin 29%, Cephalothin 23%, Co-trimoxazole 23%, Nalidixic acid 21% and Co-amoxyclave 3% showed sensitivity. These results showed widespread use of these antibiotics and it's followed by creation of high resistance in isolated *E. coli*. So that, Ampicillin and Co-amoxyclave with 90% and 81% of resistance, was known as ineffective antibiotics against *E. coli*.

Conclusion

According to various studies, as well as results obtained by specialist researchers about this issue all over the world, it can be concluded that according to the continuous changes in causing factors of UTI (which this factor would cause some changes in sensitivity or resistance in bacteria to the antibiotics), and also based on different impacts of each special condition on various regions (which would cause some changes in sensitivity or resistance in bacteria to the antibiotics), it's recommended that for appropriate treatment and prevention of bacterial resistance, before prescribing antibiotics, certainly by antibiogram test, would be sure that antibiotics have positive effects on related infections.

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