

ANTIBIOTIC RESISTANCE OF *ESCHERICHIA COLI* ISOLATED FROM PATIENTS IN SHAHID SADOUGHI HOSPITAL, YAZD, IRAN

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ABSTRACT

OBJECTIVES: The enhancement of antibiotic resistance has been ascribed to a collection of microbial characteristics, the selective pressure of antibiotic use and social and technical vicissitudes that enhance the transmission of resistant organisms. The aim of this study was to investigate antimicrobial-resistance to *Escherichia coli* isolated from patients in Shahid Sadoughi hospital of Yazd.

METHODS: Antimicrobial susceptibility to cefixime, cefotaxime, ceftazidime, ceftriaxone, ciprofloxacin, gentamicin, imipenem, cotrimoxazole and nalidixic acid was determined for 492 *E. coli* isolates obtained from patients in Shahid Sadoughi hospital of Yazd in 2012.

RESULTS: In this study, imipenem was the most active agent (70.1% susceptible), followed by gentamicin and ciprofloxacin. High rates of resistance were observed to nalidixic acid (69.9%) and cotrimoxazole (62.2%).

CONCLUSIONS: The investigation of antimicrobial susceptibility is essential, and will help to identify *E. coli* resistance to antimicrobial agents and attempt to limit its spread.

KEY WORDS: *Escherichia coli*- Antimicrobial agents- Resistance

INTRODUCTION:

Antibiotics have played an important role in reducing sickness and mortality associated with infectious and tropical diseases in humans and animals. However, optional enforcement applied by these agents use also has been the primary driving power behind the emergence and extension of antibiotic-resistance properties among all bacteria¹.

Antimicrobial agents have primarily been used to cure infectious diseases caused by bacteria. Application of antibiotics is an important risk factor for extension of resistance to these agents².

The number of bacteria that are resistant to antibiotics in the perimeter augments with the application of antibiotics³⁻⁵.

Antimicrobial agents- resistant bacteria deploy

between various strains in different environments⁶⁻⁹.

The resistant strains such as *Escherichia coli*, *Campylobacter* spp. and *Enterococcus* spp. propagate from products related to poultry to buyers place them at hazard to antibiotic-resistant bacteria¹⁰⁻¹³.

Pathogenic strains of *E. coli* cause infections including urinary tract infection, gastroenteritis, meningitis, septicemia and peritonitis^{14,15}.

Escherichia coli is one of the most usual agents of morbidity and mortality throughout the world particularly in developing countries^{16,17}.

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Remedial answers vary pertaining to the type of infection¹⁸.

Resistant *E.coli* to antibiotics is associated with decreases in clinical remedy levels and higher danger of regression¹⁹⁻²¹.

A study was conducted to estimate the prevalence and the antimicrobial resistance of *E. coli* isolates. The most frequent resistance was related to streptomycin, followed by ampicillin and nalidixic acid²².

Another study was performed to investigate antibiotic resistance of *E. coli* in Bangladesh. 50 identified strains were subjected to 13 antimicrobial agents to examine their susceptibility. In this study, none of the strains showed resistance to gentamicin²³.

A study was conducted to evaluate the sensitivity of antibiotics to *E. coli* strains isolated from several types of infected wounds. The results revealed a high sensitivity to amikacin and imipenem²⁴.

Antimicrobial susceptibility of *Escherichia coli* and other coliforms isolated from asymptomatic male and female students of Niger Delta University in Bayelsa State, Nigeria has been investigated. The highest rate of sensitivity was to gentamicin 25.

OBJECTIVE OF THE STUDY:

The purpose of this study was to investigate antimicrobial-resistance to *E. coli* isolated from patients in Shahid Sadoughi hospital of Yazd.

MATERIAL & METHODS:

This descriptive study was performed on 492 *E. coli* obtained from patients with positive cultures in the laboratory of Shahid Sadoughi hospital of Yazd, Iran from January 2011 to December 2012.

The sample types were including urine, blood, discharge (416 urine, 71 blood, 5 discharge samples).

Examined antibiotic types in antibiogram test were including: cefixime, cefotaxime, ceftazidime, ceftriaxone, ciprofloxacin, gentamicin, imipenem, cotrimoxazole and nalidixic acid that were evaluated for antimicrobial-resistance to *E. coli*.

In disk diffusion assay which was used in this study, within 15 min after applying the

antibiotic discs the plates were inverted and incubated at 37 °C. After 24h of incubation, the plates were examined, and the diameters of the zones of complete inhibition to the nearest whole millimeter were measured.

The Antibiotic discs have been made by (Oxoid, Australia Company). The information was first collected from Shahid Sadoughi hospital laboratory, and then the data was analyzed with the software Spss (version 16).

RESULTS:

The present study included antimicrobial susceptibility data for *E. coli* isolates obtained from patients with positive cultures in Shahid Sadoughi hospital of Yazd.

The total of 492 samples were tested out of which 148 (30.1%) were male and 344 (69.9%) were female (Table 1). The mean age of patients was 51.86 years.

The highest rates of resistance were against nalidixic acid (69.9%), cotrimoxazole (62.2%), cefixime (48.4%), cefotaxime (44.1%), ceftriaxone (44.1%) and ceftazidime (43.3%). Low levels of resistance were against ciprofloxacin (34.6%), imipenem (25.6%) and gentamicin (25.4%).

Susceptible(S), intermediate (I) and resistant (R) percentages of the isolates to the antimicrobial agents have been showed in Table 2.

Resistance and susceptibility observed in the different samples against an antibiotic were different, for example, the highest sensitivity to cefixime (48.9%) was observed in *E.coli* isolated from blood culture and the highest resistance to cefixime (100%) was related to *E.coli* isolated from discharge samples. About cefotaxime the highest sensitivity (50.5%) was observed in *E.coli* isolated from blood culture and the highest resistance (100%) was related to *E.coli* isolated from discharge samples. Also, the highest sensitivity to ceftazidime (54.5%) was observed in *E.coli* isolated from blood culture and the highest resistance (100%) was related to *E.coli* isolated from discharge samples.

The highest sensitivities to ceftriaxone, ciprofloxacin, gentamicin and imipenem were observed in *E.coli* isolated from blood culture (53.1%, 69.4%, 63.7%, 76.5%,

respectively). Also, the highest resistances to ceftriaxone, ciprofloxacin, gentamicin and imipenem were related to *E. coli* isolated from discharge samples (100%, 83.3%, 50%, 80%, respectively).

About cotrimoxazole the highest sensitivity (66.7%) was observed in *E. coli* isolated from discharge samples and the highest resistance (65.9%) was related to *E. coli* isolated from urine culture. Finally, the highest sensitivity to nalidixic acid (26.7%) was observed in *E. coli* isolated from urine culture and the highest resistance (68.2%) was related to *E. coli* isolated from blood culture.

DISCUSSION:

Infectious diseases by resistant bacteria have been an extraordinary fondness in all medical and therapeutic centers. The development of antibiotic-resistant bacterial strains is an appearing worldwide danger that increasingly menaces the successful remedy of diseases related to these strains. *E. coli* is one of antibiotic-resistant gram-negative bacteria in hospitals. This bacterium causes infections including urinary tract infection, gastroenteritis, septicemia and meningitis¹⁹⁻²¹.

In a study, the most repetitious resistances to *E. coli* were streptomycin (100 %), ampicillin (60%), and nalidixic acid (50%). Two hundred and forty samples of new raw chicken liver were obtained from national fowl producers in different badger marketing sites and tested for the presentment of *E. coli*. One hundred *E. coli* strains were separated and tested for susceptibility against antibiotics. The study was performed to estimate the antimicrobial resistance of *E. coli* related to raw chicken liver in Lithuania²². The association between this study and present study was that in our study resistance against nalidixic acid (69.9%) was also proved.

In another study that was performed in the capital city of Bangladesh, investigated antibiotic resistance of *E. coli* obtained from fowl sources of different markets. None of the strains showed resistance to norfloxacin and gentamicin. 86%, 80%, 60%, 36%, 30%, and 26% of the strains were sensitive to norfloxacin, gentamicin and chloramphenicol, neomycin, tetracycline, streptomycin and ampicillin,

respectively²³. Our findings also showed sensitivity against gentamicin (64.6%).

In another study in Oradea, Romania, the sensitivity of antibiotics to *E. coli* variants separated from several types of infected wounds in patients hospitalized into the Emergency Hospital was evaluated. The outcomes showed the highest sensitivity (75%) to amikacin, between 35-50% to IV-th generation cephalosporins and 52.3% to imipenem. It has been shown a lower rate of sensitivity to gentamicin (38.6%). All *E. coli* variants separated from surgical wounds were sensitive to amikacin, gentamicin, cefoperazone, ceftriaxone, imipenem and ciprofloxacin²⁴. In comparison with this study we have also demonstrated a high sensitivity against imipenem (70.1%).

A study was conducted to investigate antimicrobial susceptibility of *E. coli* and other coliforms separated from male and female students without sign of Niger Delta University in Bayelsa State, Nigeria, has been investigated in another study. *E. coli* and other coliforms from midstream clean-catch urine samples of students were separated and tested for their susceptibility to commonly used antimicrobial agents. Resistances against several antibiotics were noticed significantly in both *E. coli* (83.9%) and the unclassified coliforms (100%). In this study, the highest susceptibility was against gentamicin (64.5% for *E. coli* and 33.3% for unclassified coliforms)²⁵. Comparison of this study with present study showed that in the present study a high sensitivity against gentamicin (64.6%) was also demonstrated.

Therefore our goal was to investigate antimicrobial-resistance to *E. coli* isolated from patients in Shahid Sadoughi hospital of Yazd.

CONCLUSION:

This study represents high level resistant of *E. coli* isolates against nalidixic acid. It is because of inappropriate and incorrect administration of antimicrobial agents. This problem remarks significance of performing antimicrobial susceptibility testing before empiric antibiotic therapy. To overcome this problem use of unnecessary antibiotics therapy should be limited.

Table 1: Sex distribution of the patients (N=492)

Sex	Number of patients	Percentage
Male	148	30.1
Female	344	69.9

Table 2: Antimicrobial susceptibility of *E.coli* isolates

Antimicrobial agent	Resistant, n (%)	Susceptible, n (%)	Intermediate, n (%)	Total
Cefixime	238 (48.4)	233 (47.4)	21 (4.3)	492 (100)
Cefotaxime	217 (44.1)	259 (52.6)	16 (3.3)	492 (100)
Ceftazidime	213 (43.3)	244 (49.6)	35 (7.1)	492 (100)
Ceftriaxone	217 (44.1)	267 (54.3)	8 (1.6)	492 (100)
Ciprofloxacin	170 (34.6)	304 (61.8)	18 (3.7)	492 (100)
Gentamicin	125 (25.4)	318 (64.6)	49 (10)	492 (100)
Imipenem	126 (25.6)	345 (70.1)	21 (4.3)	492 (100)
Cotrimoxazole	306 (62.2)	177 (36)	9 (1.8)	492 (100)
Nalidixic acid	344 (69.9)	116 (23.6)	32 (6.5)	492 (100)

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