



Comparative AntibioGram of Escherichia Coli Isolated from the Urinary Tract Infection in Patients from Tertiary Care Hospital

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Introduction: UTI occurs when bacteria that live inside intestine find their way into the urinary tract through the urethra. Women are familiar to be a lot of at risk of UTI than men, with a five hundredth probability of a UTI in their life.

Aim: The aim of this study was to find the antibiotic resistance pattern in *Escherichia coli* isolated from urinary tract infection with commonly found antibiotics among different age and sex groups.

Materials and Methods: All positive urine samples for *Escherichia coli* obtained from patients were included. On the basis of colony morphology and biochemical tests Isolates were identified. The antibiogram profile of the isolates was determined by commonly used antibiotics.

Result: In this studied, total 250 patients with UTI of both sexes were included and divided into age group. Samples processed only 250 samples with the growth of *E. coli* were included in this studied. The isolated *E.coli* showed more resistant to some degree to all the antibiotics tested. The greatest resistance was shown against Amoxycillin (15.2% isolated were sensitive) and the least resistance was shown against Imipenem (96.4% isolated were sensitive).

Conclusion: The pattern of antibiotic resistance varies from place to place, region to region, and country to country. Antimicrobial resistance should be monitored on a regular basis in both the community and hospital settings.

Keywords: Urinary tract infection; Escherichia coli; antibiotic resistance; multidrug resistant.

1. INTRODUCTION

Urinary tract infections (UTIs) are the foremost prevailing microorganism infections encountered in adult medical aid throughout the globe [1]. Typically UTI occurs when bacteria that live inside intestine find their way into the urinary tract through the urethra. Women are familiar to be a lot of at risk of UTI than men, with a five hundredth probability of a UTI in their life [2-3]. Most of the cases of community-acquired urinary tract infection in women are caused by family Enterobacteriaceae, with *Escherichia coli* being the foremost of times isolated microorganism [4]. With an estimated 150 million cases diagnosed per year, urinary tract infection (UTI) is one of the most serious bacterial infections in community medicine today [5]. While UTI affects both men and women of all ages, women are more likely than men to develop a UTI because the female urethra is much shorter and closer to the anus. As a result, approximately 60% of all women would have at least one UTI during their lifetime, with 20–30% of those suffering from chronic infection [6-7]. The urinary tract has a variety of mechanisms in place to hold infection at bay. Urination washes bacteria out of the body since the points where the ureters attach to the bladder serve as one-way valves, preventing urine from backing up or refluxing into the kidneys [8]. On the other hand, UTI in men is relatively uncommon. Men under the age of 50 have a prevalence of around 0.1 percent, and it has been found that the prostate gland in men has some anti-bacterial activity. More than 85 percent of all UTIs are caused by *E. coli*, *Klebsiella spp.*, *Enterobacter spp.*, *Proteus spp.*, *Streptococcus group B*, and *Enterococci sp.* are among the bacteria that cause UTI [9]. Antimicrobial resistance in *E. coli* has been recorded all over the world, and rising resistance rates in *E. coli* are becoming a growing concern in both developed and developing countries [10-11]. Antibiotic resistance has developed as a result of widespread and excessive use of antibiotics, which has become a major health problem. Furthermore, the ever-evolving trend of antibiotic resistance underscores the value of ongoing investigation to ensure successful UTI treatment

[12]. As a consequence, constant monitoring of antimicrobial resistance for specific microorganisms in their specific environments is needed. In various countries, drug resistance to bacteria has been observed ranging from 1% to more than 50%. *E. coli* occurrence and susceptibility profiles indicate major geographic differences as well as significant differences in different populations and ecosystems [13]. The aim of this study was to find the antibiotic resistance pattern in *Escherichia coli* isolated from urinary tract infection with commonly found antibiotics among different age and sex groups.

2. MATERIALS AND METHODS

This study was prospective study which includes all the patients attending Out Patient Department (OPD) and In Patient Department (IPD) of Shalinitai Meghe Hospital and Research Centre with UTI symptoms and confirmed by positive urine culture. This study was conducted in the Department of Microbiology at Datta Meghe Medical College, Shalinitai Meghe Hospital and Research Centre Wanadongri, Nagpur in collaboration with Jawaharlal Nehru Medical College, Datta Meghe Institute of Medical Sciences, Wardha, from January 2021 to March 2021. Patients with clinical symptom that indicate UTI but organisms not grown in the urine culture and those who has taken antibiotic before urine sample collection were excluded from the study. Total, 250 patients with clinical symptoms of UTI were investigated. Clean-catch midstream urine of the patients was collected in a sterile urine container, immediately transported to the laboratory in bacteriology section of Microbiology Department. Proper guidelines for specimen collection were given to all the patients [14]. Samples were processed by using microscopy, culture for isolation and biochemical tests for the identification of isolates. Specimens were culture on Mac Conkey's Agar and Blood agar media. All the bacteria isolated from urine in this study were identified using conventional biochemical tests 14, [15-16]. Antimicrobial susceptibility testing was perform on Mueller Hinton agar (Himedia) plate using Kirby Bauer's disk diffusion technique [17] and Antibiotic sensitivity pattern was obtained by as per CLSI (Clinical and Laboratory

Standard Institute) guidelines [18]. The antibiotic disks (HiMedia) used were Cefuroxime (20 µg), Ampicillin (10µgm), Amikacin (20 mg), Cefepime (20 µg), Amoxycillin (20 µg), Nitrofurantoin (300 µg), Ciprofloxacin (5 µg), Nalidixic acid (30 µg), Imipenem (10 µg) and Gentamicin (10 µg).

3. RESULT

In this studied total 250 patients with UTI of both sexes were included and divided into age group. Samples processed only 250 samples with the growth of *E. coli* were included in this studied. This selected isolated *E.coli* was examined for their susceptibility to common antibiotics by disc diffusion method. The sensitivity of *E. coli* isolates as a comparative analysis to the antibiotics was shown in below Table 1 below. In this studied, the isolated *E.coli* showed more resistant to some degree to all the antibiotics tested. The greatest resistance was shown against Amoxycillin (15.2% isolated were sensitive) and the least resistance was shown against Imipenem (96.4% isolated were sensitive).

Table 1. Showing Antibiotic sensitivity pattern of *E. coli* isolates

Antibiotic Disc	Sensitive	Percentage
Amikacin	152	60.8
Ampicillin	63	25.2
Amoxycillin	38	15.2
Cefepime	58	23.2
Cefuroxime	125	50
Ciprofloxacin	84	33.6
Gentamicin	58	23.2
Imipenem	241	96.4
Nalidixic acid	122	48.8
Nitrofurantoin	178	71.2

In this studied, Drug resistance pattern of *E. coli* was observed according to the gender and age group. Different age groups were categorized into four classes as young male (20-35 years), elder male (above 35 years), young female (20-35 years) and elder female (above 35 years). Sensitivity and sensitivity percentage of isolated *E.coli* as comparative analysis were shown in Table 2 below. In this studied showed the elder male are of greatest resistance to antibiotics followed by young female. Elder female and young male showed less resistance, the latter being the least.

Antibiotics resistant to four or more antibiotics from the isolated *E. coli* were observed more

frequently in elder male and young female patients as shown in Table 3 below. From elder male 92.8% followed by Young female 84.8%, Young male 79.2% and Elder female 40.4% were found as multidrug resistant (resistant to 4 or more of the antibiotics). Therefore, overall multidrug resistant from the total isolates was 74.4%.

4. DISCUSSION

UTI is a major health issue around the world, with about 150 million cases registered per year [19]. In this study among the isolated *E.coli* showed 84.8% resistance to Amoxycillin, followed by resistance to Cefepime (76.8%) , resistance to Gentamicin(76.8%), resistance to Ampicillin(74.8%), resistance to Ciprofloxacin(66.4%), resistance to Nalidixic acid(51.2%) , resistance to Cefuroxime(50%), resistance to Amikacin(39.2%), resistance to Nitrofurantoin (28.8%)and resistance to Imipenem(3.6%). Amoxycillin showed most resistance whereas Imipenem showed least resistance which was more or less similar to the other studies of Kothari A et al. [20] Uzunovic-KamberovicS et al. [21]. Colodner R et al. [22]. Therefore, Imipenem is the medication of choice for treating uncomplicated UTIs, followed by Nitrofurantoin, which was found to be effective against 71.2% sensitive against *E. coli* isolates. This more or less resembles with the other studies of Nicolle [23] and Amdekar et al. [24] which showed Imipenem as maximum sensitivity against *E.coli*. Some authors have also claimed that nitrofurantoin's numerous mechanisms of action limit *E. coli*'s ability to build resistance, which may explain why susceptibility remains strong [25].

This study confirmed that, in the face of rising antimicrobial resistance, the targeted antimicrobials remained suitable choices as empirical treatment for uncomplicated UTI. It's difficult to tell what effect these findings would have on clinical practise. While the 20% resistance level is widely quoted in the literature as the maximum proportion of isolates that can be immune to an agent without compromising empirical treatment effectiveness, it is based on expert opinion and mathematical models [26].

Age, gender, recent hospitalisation, and geographic location are all risk factors for resistance in urine cultures, according to studies similar to ours. According to the studied of Toner et al. [27] showed that the sensitivity of

Table 2. Comparative analysis of sensitivity to antibiotics in different age and sex distribution

Antibiotic Disc	Young male	Percentage	Elder male	Percentage	Young female	Percentage	Elder female	Percentage
Amikacin	157	62.8	45	18	97	38.8	132	52.8
Ampicillin	93	37.2	41	16.4	63	25.2	117	46.8
Amoxycillin	86	34.4	36	14.4	74	29.6	83	33.2
Cefepime	79	31.6	55	22	34	13.6	76	30.4
Cefuroxime	121	48.4	74	29.6	64	25.6	98	39.2
Ciprofloxacin	46	18.4	34	13.6	45	18	64	25.6
Gentamicin	152	60.8	98	39.2	84	33.6	101	40.4
Imipenem	236	94.4	246	98.4	243	97.2	244	97.6
Nalidixic acid	86	34.4	43	17.2	51	20.4	57	22.8
Nitrofurantoin	132	52.8	143	57.2	56	22.4	143	57.2

Table 3. Multidrug resistant pattern in different age groups

Group	MDR	Percentage
Young male	198	79.2
Elder male	232	92.8
Young female	212	84.8
Elder female	101	40.4

uropathogens to empirical treatment differed depending on male gender, age, and hospitalisation status. Another studied of Zhanel et al. [28] found that age, gender and geographical location were risk factors for antibiotic resistance in outpatient isolates of *E. coli* [29-32].

5. CONCLUSION

This studied showed high rates of antimicrobial resistance to Amoxycillin, Cefepime, Gentamicin, Ampicillin. Imipenem and Nitrofurantoin are considered appropriate for treatment of *E. coli*. However, the pattern of antibiotic resistance varies from place to place, region to region, and country to country. Antimicrobial resistance should be monitored on a regular basis in both the community and hospital settings. As a result, regular antibiograms are needed to enhance our empirical therapy and to keep an eye out for new drugs with higher efficacy.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not

intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

ETHICAL APPROVAL

Ethical clearance taken from institutional ethics committee.

CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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