

Title -Multidrug-Resistant *Escherichia Coli* Urinary Isolates From Cases of UTI

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Abstract: Multiple resistance to antimicrobial drugs arising in *Escherichia coli* isolates may complicate therapeutic management of urinary tract infection (UTI). A study was undertaken to assess the multidrug resistance (MDR) among urinary *E. coli* isolates. We tested 12 antimicrobial drugs against 570 isolates from outpatients attending in a tertiary-care teaching hospital in Bilaspur, Chhattisgarh, India. 66% (376/576) of the isolates were resistant to three or more different classes of agents, and were considered to present MDR. Among the isolates, 73.0%, 65.0%, 58.0%, 58.0% and 31.0% were resistant to tetracycline, ampicillin, cephalothin, trimethoprim-sulfamethoxazole (TMP/SMX) and norfloxacin, Aztreonam respectively. The predominant phenotype among the MDR isolates presented is ampicillin, TMP/SMX and tetracycline resistance. The high prevalence of drug resistance among patients with UTI calls for continuous surveillance to assure effective control of this infection.

Keywords: Urinary tract infections, *Escherichia coli*, Antimicrobial susceptibility, Multidrug-resistance.

1. INTRODUCTION

Urinary tract infections (UTIs) are the common infections with an estimated annual global incidence of at least 250 million cases, being costly to both patients and health care funding system. *Escherichia coli* are the predominant pathogen implicated in UTI. [1]

Non-complicated infections, particularly in women, account for the highest number of UTIs. Women diagnosed for acute uncomplicated cystitis are usually treated as outpatients. The microbiologic characteristics of this infection are highly predictable even in otherwise healthy subjects. Physicians have therefore been advised that empirical antimicrobial treatment not requiring culture is appropriate in such cases [2]. Therefore, the empirical therapy has been so widely used that only a few UTIs were routinely cultured. However studies clearly demonstrated an increasing antibiotic resistance in *E. coli* causing both community and nosocomially acquired UTIs [3-4].

It is pertinent to know the pathogenic bacteria and their susceptibility patterns for proper selection and use of antibiotics as well as for an appropriate prescribing policy. The aim of the present study was to define occurrence and phenotypes of multidrug-resistant (MDR) *E. coli* among UTI isolates from Chhattisgarh Institute of Medical Sciences, Bilaspur, Chhattisgarh India.

2. MATERIALS AND METHODS

2.1 Bacterial Isolates

A total of 570 strains of *E. coli* were isolated from ninety six subjects aged between 0 and 15 years (eight women [w]), 130 aged between 16 and 39 years (10 w and one man [m]) and 344 aged > 40

years (22 w and 26 m) from the outpatient facility of the Department of Microbiology Chhattisgarh Institute of Medical Sciences, Bilaspur, Chhattisgarh India.

Isolates were collected between **July 2010 and June 2013** in a three year study period. UTI diagnoses were established on the basis of clinical symptoms and laboratory investigation. The isolation and identification of *E. coli* strains were performed by minimal standard bacteriological tests, using conventional biochemical markers [5-6].

2.2 Susceptibility Testing

Antimicrobial susceptibility was determined by the Kirby-Bauer disk diffusion method following the definition of the National Committee of Clinical Laboratory Standards (NCCLS) for agar diffusion tests⁷ using antibiotic-containing disks. The antimicrobial drugs used were: ampicillin (10 µg), cephalothin (30 µg), cefoxitin (30 µg), cefuroxime (30 µg), ceftriaxone (30 µg), gentamicin (10 µg), tobramycin (10 µg), tetracycline (30 µg), norfloxacin (10 µg), nitrofurantoin (300 µg), cotrimoxazole (sulfamethoxazole 23.75 µg + trimethoprim 1.75 µg), Aztreonam (30µg). Quality control was performed using *E. coli* ATCC 25922. An isolate was considered multidrug-resistant (MDR), if, it was resistant to at least three of the antimicrobial agents tested.

3. RESULTS AND DISCUSSION

The resistance of *E. coli* isolates to antimicrobial agents is shown in **Table -1**. The overall resistances to tetracycline, ampicillin, cephalothin and cotrimoxazole (trimethoprim/sulfamethoxazole-TMP/SMX) was relatively higher. Among aminoglycosides, gentamicin was the most active agent with 13% of resistance among the hospital isolates. A high resistance to norfloxacin was observed, 31.0% in the isolates.

Among the strains tested against all 12 antimicrobial agents, the percentage of isolates showing MDR was high as (76.0%). The most common MDR phenotype showed was overall resistance to ampicillin, TMP/SMX and tetracycline **Table -2**.

This study provides data about the problem of resistance in *E. coli* isolates obtained from patients attending the an outpatient facility of a tertiary-care hospital. Results have demonstrated that in general the *E. coli* isolates have high rates of resistance to the commonly used antibiotics. The rates of resistance reported in this study were much higher than those published in developed countries but are similar to those reported in other developing countries [8-13].

The rates we report in the present are consistent with those reported by Gales et al [3, 14]. in antimicrobial surveillance studies. In Latin American hospitals including some from Brazil, but are higher than those reported for French or British hospitalized patients [15-16].

Many factors may have contributed to such high rates of resistance including misuse of antibiotics by health care professionals or non-skilled practitioners, misuse of antibiotics by the general public, and inadequate surveillance due to lack of information arising from routine antimicrobial susceptibility testing, like reports from other developing countries [17]. The resistance rates to isolates from municipal units reported in the present study were equal to higher or lower than others study series, but, in all of them, the reported rate of fluoroquinolone resistance was lower than that observed in the present study[10,17-19].

A significant increase in resistance of uropathogenic strains to TMP-SMX, ampicillin and cephalothin has been found worldwide [9,20], Which agree with the results reported in the present study, therefore, these agents should not be recommended for first line empirical treatment of UTI.

A Striking feature of our study was a high efficacy of older agents like gentamicin and nitrofurantoin, which had been almost forgotten, but we see a surge in their use to combat uropathogen should be considered as option for treatment [21].

Nitrofurantoin as an option for empirical therapy has been considered by many authors, since its multiple mechanisms of action seem to have enabled it to retain potent activity against *E. coli* despite nearly 50 years of use [3,8].

In the present study, Table-1 indicate the percentage of isolates demonstrating a MDR phenotype was extremely high, especially in isolates from hospital as compared to rates reported in the USA [9]. The

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most frequently observed multidrug resistance phenotypes agreed with those already reported, for ampicillin, cephalothin and TMP-SMX [8-9].

Table -1. Resistance to one or more antimicrobial agents among the *Escherichia coli* urinary tract isolates.

Number of agents to which isolates were resistant	Percentage of isolates (n° resistant / total n°)
	Hospital
0	(68/570) = 11.92%
1	(32/570) = 05.61%
2	(30/570) = 05.26%
3-4	(202/570) = 35.43%
5-7	(185/570) = 32.63%
8-12	(52/570) = 09.12%

Table -2. The most common antimicrobial resistance phenotypes showing MDR Uro-isolates.

Antimicrobial resistance phenotypes	Hospital (N° of isolates)
AMP,CFL,TMP/SMX, TET	37
CFL, TET, TOB	32
NIT, NOR, AMP,CFL,TMP/SMX, TET, CXM	25
AMP,CFL,TMP/SMX	23
NOR, AMP,CFL,TMP/SMX	14
AMP,TET,TMP/SMX	12

4. CONCLUSION

In conclusion, *E. coli* involved in UTIs isolated from patients attending the outpatient facility from a tertiary-care hospital or in a municipal health unit showed resistance for many antimicrobial agents. Also, the high number of multidrug-resistant isolates gives rise to concern. Regular monitoring of antimicrobial drugs resistance seems necessary to improve our guidelines for empirical antibiotic therapy.

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