

A Study of Antibiotic Resistance in UTI Patients at District Hospital Gandhinagar: A Comparison between Community Acquired and Hospital Acquired *E. coli*

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Abstract

Background & Objective: UTI (urinary tract infection) is the most common among all hospital acquired infections world wide. In UTI, most common organism is *E.coli*. Organism responsible for the hospital acquired infection may have tendency to develop multiple drug resistance. *E.coli* acquired from the hospital source and community source may differ in their resistant against antibiotics. **Aim:** Our aim to study and compare the antibiotic resistant pattern with special reference to ESBL (extended spectrum β lactamase) in the community acquired and hospital acquired common gram negative bacilli causing UTI in patients of district hospital Gandhinagar during period of June 2008 to may 2009. **Methods and materials:** *E.coli* from symptomatic UTI cases from both community acquired and hospital acquired UTI at district hospital Gandhinagar during period of June 2008 to May 2009 were tested for the antimicrobial susceptibility testing against 18 drug of various groups performed by Kirby Bauer's disc diffusion method. Isolates resistant to third generation cephalosporin were tested for ESBL production by double disk synergy test method. **Results:** Overall *E.coli* was (73.75%) among the all gram negative bacilli of UTI patients. The majority (70%) of the isolates were from female. ESBL prevalence was 12.6% and 25% among community acquired and hospital acquired *E.coli* respectively. Cephalosporin group of sensitivity was widely varied among both the group compare to other groups of antibiotics and more resistance was found in hospital strain. **Discussion and Conclusion:** Almost double prevalence of ESBL among hospital strain compared to community strain leads to change in line of management when a hospitalized patient has tendency to develop UTI, plain cephalosporin should not be administered in other diseases also.

Keywords: Antibiotic resistance, UTI, E. Coli, Hospital acquired infection, ESBL.

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INTRODUCTION

Urinary tract infection (UTI) is most common infectious presentation in hospital acquired and community acquired infections since long time [1, 2]. There are an estimated more than 100 million urinary tract infections per annum worldwide and cost the global economy in excess of 5 billion US dollars [3]. A limited and predictable spectrum of organisms is responsible urinary tract infections. Among both outpatients and inpatients, *Escherichia coli* is the primary urinary tract pathogen, accounting for 75% to 90% of both side - hospital acquired and community acquired UTI [4, 5].

UTIs are often treated with different broad-spectrum antibiotics when one with a narrow spectrum of activity may be appropriate because of concerns about infection with resistant organisms. Fluoroquinolones are preferred as initial agents for empiric therapy of UTI in area where resistance is

likely to be of concern [6, 7]. This is because they have high bacteriological and clinical cure rates, as well as low rates of resistance, among most common uropathogen [7-9]. The extensive uses of antimicrobial agents have invariably resulted in the development of antibiotic resistance, which, in recent years, has become a major problem worldwide.

This study is conducted to compare the frequency and drug resistance pattern in *E.coli* isolated from patients with community acquired and hospital acquired UTIs at our setup as well as identification of ESBL producer strains. This study is important for clinician in order to facilitate the empiric treatment of patients and management of patients with symptoms of UTIs. Moreover, the data would also help authorities to formulate antibiotic prescription policies.

METHODS AND MATERIALS

In our study, for the isolation of *E.coli* we selected two groups of patients - community acquired

and hospital acquired UTIs from coming or admitting at District hospital Gandhinagar, India during Period of June 2008 to May 2009. Patient's urine or urinary catheters tips were collected in sterile containers by taking aseptic techniques. Urine samples were also examined microscopically especially for pus cell to confirm urinary tract infection. Mere isolation of microorganism without suggestive of infection were excluded from this study. One group - comprised of gram negative bacilli isolates from urine of OPD patients of their first visit to hospital, was of community acquired UTI. These patients were not admitted in any hospital either at least during last one year or at all. Another group - comprised of gram negative bacilli isolates from urine or urinary catheters tips or catheterized urine, was of hospitalized patients who have developed UTI at least after 72 hours of admission. In this study we had isolated total 59 *E.coli* from 60% and 40% of community acquired and hospital acquired UTIs respectively. The present study was conducted to determine in vitro susceptibilities among this *E.coli* from above described two groups against the 18 antibiotic of various groups. These are Cefadroxil, Cefuroxime, Cefotaxime, ceftriaxone, Cefoperazone, ceftazidime, Cefixime, cefepime, aztreonam, imipenem, gatifloxacin, levofloxacin, tetracycline, Chloramphenicol, nitrofurantoin, amikacin, gentamicin, and piperacillin. We also performed ESBL screening test of all *E.coli*. Antimicrobial susceptibility testing was performed using the disk diffusion method as described by the CLSI (Clinical Laboratory Standard Institute) (earlier called as National Committee for Clinical Laboratory Standards) [12]. The CLSI- ESBL phenotypic confirmatory test with ceftazidime, cephotaxime, ceftriaxone and cefixime were performed for all the isolates by disk diffusion method on Mueller-Hinton agar plates with and without 10 µg of

amoxyclav. Susceptibility test results were interpreted according to the criteria established by the CLSI [13]. $A \geq 5$ -mm increase in the zone of diameter of third generation cephalosporins, tested in combination with amoxyclav versus its zone when tested alone was considered indicative of ESBL production. Results are compared for both the group of *E.coli*.

RESULTS

Of the all 80 significant gram negative bacilli isolates, *E. coli* was 59 (73.75%) the most prevalent microorganisms in both groups UTI patients. Among them Overall 70% and 30% were of female and male patients respectively. Age and gender wise data of prevalence revealed that *E. coli* infection was found to be more prevalent female candidates (Table 1 & 2).

Table-1: Age and gender wise distribution and frequency of *E. coli* isolated from UTI (n=59)

Patient (gender)	Male	Female
Community Acquired UTI	30 %	70%
Hospital Acquired UTI	40%	60 %

Table-2:

AGE- group	MALE (%)	FEMALE (%)
< 10 year	0	2
11-30	15	32
31-50	20	16
51-70	30	20
>= 71	35	30

The antimicrobial potency and spectrum for 18 selected antimicrobial agents of different classes against UTI pathogen *E. coli* s are summarized in Table-3. Among the β -lactam antibiotics, imipenem had the widest coverage against *E. coli* isolates (100%) in both the groups, followed by Fluoroquinolones (95 to 100%) and amikacin (80% to 97%).

Table-3: Frequency and resistance pattern of *E. coli* isolated from UTI against 18 selected antimicrobial agents tested (n=59)

Group of Antibiotic	Antimicrobial Agent	Percentage(%) of Resistant to Antimicrobial Agent	
		Community acquired UTI	Hospital Acquired UTI
First generation Cephalosporin	Cefadroxil	38	100
Second generation Cephalosporin	Cefuroxime	44	100
Third generation cephalosporin	Cefotaxime	27	55
	Ceftriaxone	28	35
	Cefoperazone	27	50
	Ceftazidime	16	30
	cefixime	38	90
Forth generation Cephalosporin	Cefepime	16	20
ESBL Producers (%)		12.6	25
	Piperacillin	44	80
Monobactam	Aztreonam	27	50
Carbapenem	Imipenem	0	0
Fluoroquinolones	Gatifloxacin	1	0
	Levofloxacin	5	0
Others	Tetracycline	55	40
	chloramphenicol	11	20
	nitrofurantoin	16	20
Aminoglycosides	Amikacin	3	5
	Gentamicin	11	20

DISCUSSION AND CONCLUSION

Antibiotic resistance is a major clinical problem in treating infections. The resistance to the antimicrobials has increased over the years. Resistance rates vary from place to place [14]. Though bacterial urinary tract infection is common, it is not always possible to do bacterial culture and antibiotic sensitivity report for the treatment especially in small centers. Even where this test is done for in patients or out patients, many times initially antibiotics are started earlier before the arrival of report and afterward changes are made if required. For initial antibiotic treatment to be effective, we required knowledge about the prevalent sensitivity pattern among the bacterial causing UTI in our area and also must have the constant watch over the development of resistant Overall 70 % infection occurred in female. Men are usually less prone to UTI as compared females, owing to the longer course of the urethra and bacteriostatic properties of prostate secretions. Among both group Quinolones have maintained a high level of activity against UTI isolates of *E. coli*. Other agents, such chloramphenicol, nitrofurantoin, amikacin haven't developed significant resistance and no difference in resistance of both group observed. But the beta lactam group resistance is more significantly ($p < .05$) in hospital group. This may be due to increased prevalence in beta lactamase with or without ESBL in hospital environmental bacteria. Though the bacterial spectrum causing community-acquired UTI remained the same over time, the antibiotic susceptibility has changed [15]. Worldwide ESBL prevalence in community and hospital widely varies [16, 17]. In the present study, 12.6% and 25% isolates were ESBL-positive for community and hospital acquired UTI. India has reported an ESBL positivity rate between 26.9% and 48.3% [18-21]. ESBL producers do not respond to the usually prescribed empirical therapy. Also, there is an increased risk of associated morbidity and mortality, and cost of therapy when these patients are put on the standard empirical therapy [22]. There should be constant watch over the local ESBL prevalence as there is report of ESBL positive up to 52% even in community acquired UTI [23] and the high rate of ESBL positivity will warrant a change in the empirical therapy for UTI to prevent the complications.

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