Antibiotic Resistance Pattern of Urinary Tract Isolates of Escherichia coli from Kumaun Region

Dr. Vinita Rawat, * Dr. Umesh, Ms. Priyanka Paul *****

* Assistant Professor,** Associate Professor , *** Senior Resident, Department Microbiology, Govt. Medical College, Haldwani (Nainital), Uttarakhand, INDIA

Abstract : Background: Concurrent resistance to antimicrobials of different structural classes has arisen in a multitude of bacterial species and may complicate the therapeutic management of infections, including those of the urinary tract. Aim: To assess the resistance pattern among *Escherichia coli* from urinary isolates a retrospective in vitro surveillance study carried out in the Department of Microbiology, Uttarakhand Forest Hospital Trust Medical College from Jan. 2008- Dec. 2008. Materials and methods: Urine specimens were transported in sterile, leak-proof containers to the bacteriology laboratory immediately or if there was a delay, refrigerated for 4hrs before processing. Specimens were inoculated on cystine lactose electrolyte-deficient medium by semi quantitative method. The specimen yielding more than or equal to 10^5 organisms/ml of urine was interpreted as significant. Bacterial count less than this were considered insignificant. Growth of 3 or more than 3 organisms were considered contamination. Bacterial pathogens were identified by conventional biochemical methods according to standard microbiological techniques. Antimicrobial sensitivity was performed by the standard disk diffusion method. Results: *E.coli* was the most common uropathogen (57.76%) isolated and 94.29% of *E.coli* showed resistance to ampicillin, 92% to amoxycillin- salbactam, 70.86% to gentamicin, 65.71% to amikacin, 89.71% to cefuroxime, 72.57% to cefotaxime,76% to cefriaxone, 90.28% to ciprofloxacin, 61.14% to chlormphenicol, 42.86% to nitrofurantoin, 28% to piperacillin-tazobactam and 8.57% to imipenem. Multidrug resistance was defined as resistance to two or more classes of antibiotics. Multidrug resistance was detected in 97% isolates. Conclusion: These findings call for wiser use of antimicrobial agents and their continuous in vitro monitoring.

Key-words: *E.Coli*, UTI, Antibiotic Resistance

Corresponding Author: Dr. Vinita Rawat, Assistant Professor, Department Microbiology, Govt. Medical College, Haldwani (Nainital), Uttarakhand, E-mail: drvinitarawat@gmail.com

INTRODUCTION: The increasing prevalence of antimicrobial resistance is a major health problem and is associated with high morbidity and mortality[1]. Many bacterial species, including *E.coli*, are showing an increasing resistance to antibiotics. *E.coli* is an important pathogen of urinary tract [2]. Multiple drug resistance (MDR) among *E.coli* isolates have been reported from many parts of world[2, 3] and these rates of resistance to antibiotics differ from region to region. Regional and local descriptions of antibiotic resistance add to the global view of antimicrobial resistance [3] and data may be useful to avail of information on prevailing level of antimicrobial resistance among the urinary isolates.

Given that the majority of therapy for UTIs is empirical and that urinary tract pathogens are demonstrating increasing antimicrobial resistance, continuously updated data on antimicrobial susceptibility patterns would be beneficial to guide empiric treatment and would help the physician in the selection of antibiotics [2]. To our knowledge this is the first study from Kaumon region. Hence, this retrospective study was carried out to know the resistance pattern of *E.coli* isolates from urine specimen.

MATERIAL AND METHODS: This retrospective analysis included 608 consecutive urinary samples obtain from patients admitted to various specialties

of Uttarakhand Forest Hospital Trust Medical College, Haldwani from Jan. 2008-Dec.2008.

Specimens: The specimens were transported in sterile, leak-proof containers to the bacteriology laboratory immediately or if there was a delay, refrigerated for 4hrs before processing.

Culture: All specimens were inoculated on cystine lactose electrolyte-deficient medium, (Hi Media, India) by semi quantitative method. The specimen yielding more than or equal to 10^5 organisms/ml of urine was interpreted as significant.[4] Bacterial count less than this were considered insignificant. Growth of 3 or more than 3 organisms were considered contamination. Bacterial pathogens were identified by conventional biochemical methods according to standard microbiological techniques[5].

Antimicrobial sensitivity testing: Antimicrobial sensitivity was performed on Mueller-Hinton agar (Hi-Media, India) by the standard disk diffusion method recommended by the Clinical and laboratory Standards Institute (previously NCCLS)[6].

RESULTS: Of the 608 urine samples received for culture during the study period, 303 (49.83%) were culture positive. Distribution of organisms is shown in table-1.

Organisms isolated from urine specimen (Table-1)

Organism	Frequency	Percent
E.coli	175	57.76
S. aureus	43	14.19
Klebseilla spp	28	9.24
Enterobacter spp	25	8.25
Proteus spp	12	3.96
Pseudomonas spp	8	2.64
Acinetobactor spp	8	2.64
Coagulase-negative Staphylococcus	4	1.32
Total	303	100

Antibacterial resistance of *E.coli* isolates showed 94.29% were resistant to ampicillin, 92% to amoxycillin- salbactam, 70.86% to gentamicin, 65.71% to amikacin, 89.71% to cefuroxime, 72.57% to cefotaxime,76% to cefriaxone, 90.28% to ciprofloxacin, 61.14% to chlormphenicol, 46.29% to nitrofurantoin, 28% to piperacillin-tazobactam and 8.57% to imipenem (Table 2). Multidrug resistance was defined as resistance to 2 or more classes of antibiotics. Multidrug resistance was detected in 97% isolates.

Antibiotic Resistance pattern of E.coli (Table -2)

Antibiotics	Sensitive (%)	Resistant (%)
Ampicillin	10 (5.71)	165 (94.29)
Amoxycilin-salbactam	14 (8)	161 (92)
Gentamicin	51 (29.14)	124 (70.86)
Amikacin	60 (34.29)	115 (65.71)
Cefuroxime	18 (10.29)	157(89.71)
Cefotaxime	48(27.43)	127 (72.57)
Ceftriaxone	42 (24)	133 (76)
Ciprofloxacin	17 (9.72)	158 (90.28)
Chlormphenicol	68 (38.86)	107 (61.14)
Nitrofurantoin	94 (53.71)	81 (46.29)
Piperacillin-tazobactam	126(72)	49 (28)
Imipenem	160 (91.43)	15 (8.57)

DISCUSSION: UTI continue to be the commonest nosocomial infection [1] according for approximately 40% of all hospital acquired infection[7]. *E.coli* is the most prevalent pathogen contributing to these infection [2,7], but resistance is seen nearly 70-80% of the strains to the commonly used antibiotics [1]. In our study highest resistance was found against ampicillin (94.29%). This is in concordance with the prevalence rate reported from Chandigarh [8], though resistance against ciprofloxacin (52%) and nitrofurantoin (15%) was much lower than seen in our study.

Ciprofloxacin is considered highly effective in treatment of UTI because of its concentrating ability in urine and high renal clearance[9]. A study conducted in pediatric population of 50 hospitalized patient with UTI, showed 100% susceptibility of *E.coli* against ciprofloxacin[10], however wide spread use of fluoroquinolone, there have been reports of evolving bacterial resistance to ciprofloxacin[3,7,8]. Prevalence of fluoroquinolone resistance is related

to the intensity of antibiotic use[11]. In the current study, high rate of resistance to ciprofloxacin (90.28%) warrant special attention and call for improvement in antibiotics prescribing habit.

Nitrofuantoin was found to be the most effective in UTI[2,3,8,]. Since nitrofurantoin has a single indication ie acute cystitis, narrow tissue distribution, negligible serum concentration, bactericidal activity against *E.coli* in urine at therapeutic doses [12]. We found 46.29% resistance against nitrofurantoin.

Inhibitor resistance is an emerging problem making therapy with cephalosporins a difficult problem day by day [7]. Among the ß lactam / ß lactamase inhibitor combination we observed 92% resistance to amoxicillin- clavulanic acid, while only 28% to pipreracillin-tazobactam which is consistence with the prevalence reported from Hyderabad [13]. Tazobactam in combination with piperacillin has an excellent clinical efficacy in various infections [14]. Tazobactam seems to be the most promising ß lactamase inhibitor, which has unlike clavulanic acid and salbactam, its own antibiotic activity [15].

E.coli exhibited higher resistance among aminoglycoside (70% to gentamicin & 65.5% to amikacin) which was consistent with the study from Delhi [7] while a study from Chandigarh[8] have reported 40% resistance to gentamicin and only 9% to amikacin. Multiple factors play role in development of antibiotic resistance, and non human use of antibiotics like agriculture, veterinary practice and poultry may be the cause of antibiotics resistance[1].

Study shows that multiple resistance is a common problem in hospital pathogens. Higher resistance exhibited to ß-lactam, aminoglycosides fluoroquinolone may have accounted due to increased use of these drugs in this area and referral hospital status of our hospital and prior treatment with multiple antibiotics. However, we had no available data on the use of antibiotics in our hospital to correlate antibiotics consumption with resistance rate. Imipenem showed the least resistance against *E.coli* isolates, but its use should be limited to indications in which this class of agents has clear therapeutic advantage over other antibacterial agents. Piperacillin-tazobactam was found most effective antibiotic and can be used as empiric therapy. High rates of resistance to the commonly used oral antibiotics (ampicillin, amoxicillin-salbactam, ciprofloxacin, and cephalosporin), precludes their use in empirical treatment for *E.coli* infection. These high rates of resistance are alarming and call for wiser use of antibiotics and continued evaluation of susceptibility pattern to traditional as well as new antimicrobial should be done to ascertain the optimal empiric therapy.

REFERENCES:

1. Kapil A. The challenge of antibiotic resistance: Need to contemplate. Indian J Med Res 2005; 121: 83-91.
2. Sahm DF, Thornsberry C, Mayfield DC, Jones ME, Karlowsky JA. Multidrug- resistant urinary isolates of Escherichia coli: prevalence and patient demographics in the United States in 2000. Antimicrob Agents Chemother 2001; 45: 1402-6.
3. Al- Tawfiq JA. Increasing antibiotic resistance among isolates of Escherichia coli recovered from inpatient and outpatients in a Saudi Arabian hospital. Infect Control Hosp Epidemiol 2006; 27: 748-753.
4. Colle JG, Duguid JP, Fraser AG, Marmion BP, Simmon A. Laboratory strategy in the diagnosis of infective syndrome. In: Collee JG, Faser AG, Marmion BP, Simmons A (editors). Mackie and McCartney. Practical Medical Microbiology 14th ed. London: Churchill Livingstone 1996; p.84-90.
5. Colle JG, Miles RS, Watt B. Test for the identification of bacteria. In: Collee JG, Faser AG, Marmion BP, Simmons A (editors). Mackie and McCartney. Practical Medical Microbiology 14th ed. London: Churchill Livingstone 1996; p.131-145.
6. National committee for Clinical Laboratory Standards. Performance standards for antimicrobial disk susceptibility tests NCCLS document M2-A7, Approved Standard, 7th edition: Wayne, PA: NCCLS, 2000.
7. Mohanty S, Kapil A, Das BK, Dhawan B. Antimicrobial resistance profile of nosocomial

uropathogens in a tertiary care hospital. Indian J Med Sci 2003; 57: 148-54.
8. Gupta V, Yadav A, Joshi RM. Antibiotic resistance pattern in uropathogen. Indian J Med Microbiol 2002; 20: 96-8.
9. Piddock LJV, Wise R. Mechanism of resistance to quinolones and clinical prospectives. J Antimicrobial Chemother. 1989; 23: 427-483.
10. Hossain N, Ahmed Z, Mostali M. urinary tract infection in children. A study of 50 cases. Bangaladesh Armed Forces Med J 1996; 20: 6164.
11. Zervos MJ, Herhberger E, Nicolau DP, et al.Relationship between fluoroquinolone use and changes in susceptibility to fluoroquinolones of selected pathogens in 10 United States teaching hospitals, 1991-2000. Clin Infect Dis 2003; 37 1643-48.
12. Karlowsky JA, Kelly LJ, Thornsberry C, Jones ME, Sahm DF. Trends in antimicrobial resistance among urinary isolates of outpatients in the United States. Antimicrob Agents Chemother 2002; 46: 2540-45.
13. Anuradha K, Sailaja VV, Umabala P, Satheesh T, Lakshmi V. Sensitivity pattern of gram negative bacilli to three ß- lactam/ ß- lactamase inhibitor combination using the automated API system. Indian J Med Microbiol 2007; 25: 203-8.
14. Niki Y. Fundamental and clinical studies on beta- lactamase inhibihitors. Nippon Rinssho 2001; 59: 771-6.
15. Blahova J, Hupkova M, Kremery V Sr. The effectivesness of so called potentiated penicillins (augmentin and tazobactam) in vitro. Cas Lek cesk 1995: 134: 558-61.