INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH & DEVELOPMENT

ISSN: 2278 – 0211 (Online)

Occurence Of Multiple Drug Resistant Escherichia Coli From Cases Of Urinary Tract Infections

Madhurima Goswami
Department of Microbiology, Handique Girls' College ,Guwahati , Assam

Abstract:

Urinary tract infection (UTI) caused by Escherichia coli is a serious health problem affecting millions of people each year, being the second most common infection in the community that cause morbidity or mortality in Indian subjects irrespective of age group. These pathogenic E. coli are rapidly developing multiple drug resistance. In this study fifty nine urine samples were processed and out of that 46 isolates were confirmed to be E. coli after serotyping belonging to 18 different serotypes. Antimicrobial susceptibility study was done on those 46 E. coli isolates against 24 different antimicrobial agents by disc diffusion method. Out of 46 isolates of E. coli, 42 of the isolates were found to be multidrug resistant. Therefore the emerging resistances to most of the widely used antimicrobial agents shown by the E. coli from cases of urinary tract infections suggest incorporation of appropriate measures to check drug prescribing policies or else the treatment of urinary tract infection would become more & more complicated in near future.

Keywords: *Antibiogram – Antimicrobial- Escherichia coli - Susceptibility - Urinary tract infection.*

1.Introduction

Escherichia coli are commensal organism in colon of most of the warm blooded animals including human beings. Some strains of E. coli are capable of causing disease under certain conditions when the immune system is compromised or disease may result from an environmental exposure. Urinary tract infections are probably the second most common bacterial infection and E. coli are found to be the most frequent urinary pathogens isolated from 50-90% of all uncomplicated cases of urinary tract infections2. Women are especially prone to UTIs for reasons that are not yet well understood. The E. coli normally present in the gastrointestinal tract, due to the proximity to the urinary tract ascends through the urinary passage to the urinary bladder and the kidneys to produce infections3. The present study was undertaken with a view to isolate and identify E. coli causing urinary tract infection and to study their susceptibility pattern against the antimicrobial agents , since widespread and most often the misuse of antibiotics has been a cause of alarming raise in drug resistant strains.

2.Materials & Methods

Fifty nine urine samples were collected from patients with clinical cases of UTI with no previous exposure to antibiotics. The samples were processed as per the technique of Edwards and Ewing10 for isolation and identification of E. coli. The isolates were serotyped at National Escherichia and Salmonella Centre, Kasauli (H.P.).Antimicrobial susceptibility testing of the isolates were performed by the disk diffusion method11 against 24 common antimicrobial agents (Hi-Media, Mumbai) viz. amoxycyclin/clavulanic acid, ticarcillin, ticarcillin/clavulanic acid, pipercillin, imipenem, cefazoline, cefuroxime, nalidixic acid, ciprofloxacin, gentamicin, ampicillin, amikacin, ceftazidime, cefepime, ofloxacin, tobramycin, levofloxacin, netilmycin, chloramphenicol, co-trimoxazole, norfloxacin, pipercillin tazobactum, tetracycline and nitrofurantoin on Mueller-Hinton agar (Hi-Media, Mumbai). Results were interpreted as percent sensitive (%S) and percent resistant (%R) using WHO break points.

3.Results & Discussion

A total of 46 isolates of E. coli were isolated from 59 samples (77.97%). The isolation percentage was within the generally reported isolation percentage limits of 50-90%2. Of the 46 isolates, 36 were typable and belonged to 18 different serotypes. The frequency of serotypes isolated in descending order was O25 (6), O1 (5), O6, O8, O171 (3 each), O11,

O20, O41 (2 each), O5, O62, O86, O111, O117, O130, O131, O140, O141, O153 (1 each). Six isolates were found refractory to typing and 4 were rough. All the serotypes isolated in this study and many more have been isolated by different workers from cases of UTI across India5,14.The isolates showed considerable degree of variation in their sensitivity towards these antimicrobial agents. Out of the 46 isolates of E. coli tested 4 isolates (8.64%) were found to be susceptible to all the 24 antimicrobial agents. Rest of the 42 isolates (91.36%) showed varine degree resistance to the antimicrobial agents.

Antibiogram of the isolates against 24 different antimicrobial agents showed that Imipenem (94.33%) was the most effective antimicrobial agent followed by nitrofurantoin(80.33%), pipercillin tazobactum (75.31%), amikacin (74.33%), levofloxacin,ofloxacin and ciprofloxacin (68.65% each), netilmycin (64.45%), norfloxacin (62.25%), amoxicillin/clavulanic acid (61.24%), nalidixic acid (59%), cefepime (54.57%), gentamicin (53.83%). Less than 50% of strains showed sensitive to tobramycin, cefazoline, chloramphenicol, ticarcillin/clavulanic acid, ceftazidime, ampicillin, ticarcillin, tetracycline, cefuroxime, co-trimoxazole and pipercillin (49.63%, 45.67%, 43.46%, 39.26%, 37%, 36%, 31.36%, 30.62%, 28.65%, 24% and 23%) . Antibiotic resistant pattern revealed that isolates were highly resistant to Pipercillin (77%) followed by Co-trimoxazole (76%), Cefuroxime (71.33%), Tetracycline (69.33%), Ticarcillin (68.67%), Ampicillin (64%), Ceftazidime (63%), Ticarcillin/Clavulanic Acid (60.67%), Chloramphenicol (56.67%), Cefepime, norfloxacin, amoxyclav and ciprofloxacin were also found less effective against the isolates . Similar results were reported by Zakaria15 for sensitivity and resistance pattern. Steady increase in ciprofloxacin resistant strains has been observed in various parts of the world16-18. 5 isolates of E. coli showed resistant to 13 antimicrobial agents followed by 6, 3, 2 and 26 to 10, 9, 6 and 4 antimicrobial agents. The wide spread and most often use of antimicrobial drugs, inappropriate prescribing of antibiotics and poor infection control strategies have led to a general rise in the emergence of resistant bacteria particularly to ciprofloxacin19.Use of quinolones as a routine should be discouraged and their use restricted only to grave situations associated with multiple drug resistant strains after their proper antibacterial sensitivity data are available. It must be emphasized that changes evolving in increasing drug resistance in bacterial pathogens has become a true hinderance to successful therapy of UTI and require important reassessment of local empirical choices for managing UTI.

4.Reference

1. Sears CL, Kaper JB. Enteric bacterial toxins: mechanisms of action and linkage to intestinal secretion. Microbiol Rev 1996; 60:167–215.
2. Steadman R, Topley N. The virulence of Escherichia coli in urinary tract, Chapter 3 In: Urinary tract infections. 1st Ed. Brumfitt W, Jeremy MT, Hamilton Miller. Eds (Chapman and Hall publication, London) 1998: p 37-41.
3. Acharya VN. Urinary tract infection--a dangerous and unrecognised forerunner of systemic sepsis. J Postgrad Med 1992; 38: 52-4.
4. Saxena VK, Yadav JNS. Haemagglutination and enterotoxin in Escherichia coli strains from human urinary tract infections. Indian J Med Res 1985; 81: 35.
5. Kapoor KN and Kulshrestha SB. Enterotoxigenic Echerichia coli serotypes isolated from Urinary Tract Infection. Indian J Comp Microbiol Immunol Inject Dis 1998; 19: 72-73.
6. Rathore RS, Bachhil VN, Agarwal RK, Kapoor KN. Occurrence of zoonotic shigatoxin-producing Escherichia coli among human and animals. Indian J Comp Microbiol Infect Dis 2003; 24: 201-202.
7. Tarr PI, Fouser LS, Stapleton AE, Wilson RA, Kim HH, Vary JC, Clausen CR. Hemolytic-uremic syndrome in a six-year-old girl after a urinary tract infection with Shiga-toxin producing Escherichia coli O103:H2. N Engl J Med 1996; 335: 635–8.
8. Starr M, Bennett-Wood V, Bigham AK, de Koning-Ward TF, Bordun AM, Lightfoot D, Bettelheim KA, Jones CL, Robins-Browne RM. Hemolytic-Uremic Syndrome Following Urinary Tract Infection with Enterohemorrhagic Escherichia coli : Case Report and Review. Clin Infect Dis 1998; 27: 310–5.
9. Kater AP, Westermanni AM, De Groot MR, Von Dem Borne AEGKr, Kuijper EJ. Toxin-mediated haemolytic uraemic syndrome without diarrhea. J Internal Med 2000; 248: 263-265.
10. Edwards PR, Ewing WH. Identification of enterobacteriaceae. 3rd ed. Minneapolis Burger Publishing Co. 1972.
11. Bauer AW, Kirby WMM, Sherris JC, Turck M. Antibiotic susceptibility testing by a standardized single disc method. Am J Clin Pathol 1996; 45: 493-496.
12. Osek J, Gallien P, Truszczynski M, Protz D. The use of polymerase chain reaction for determination of virulence factors of Escherichia coli strains isolated from pigs in Poland. Comp Immunol Microbiol Infect Dis 1999; 22: 53-174.

13. Khan A, Yamasaki S, Sato T, Ramamurthy T, Pal A, Datta S, Chowdhury NR, Das SC, Sikdar A, Tsukamoto T, Bhattacharya SK, Takeda, Y, Nair GB. Prevalence and genetic profiling of virulence determinants of non-O157 shiga toxin producing Escherichia coli isolated from cattle, beef and humans, Calcutta, India. Emerg Infect Dis 2002; 8: 54-62.
14. Chugh TD, Garg ML, Prakas C, Malik AK. Some biological properties of urinary and feacal E.coli isolated from cases of urinary tract infection. Indian J. Med. Res 1972; 61: 418.
15. Zakaria El A. Increasing ciprofloxacin resistance among prevalent urinary tract bacterial isolates in Gaza strip, Palestine. J Biomed and Biotech 2005; 3: 238-241.
16. Iqbal J, Rahman M, Kabir MS, Rahman M. Increassing ciprofloxacin resistance among prevalent urinary tract bacterial isolates in Bangladesh. Jpn J Med Sci Biol. 1997; 50) : 241-250.
17. Shao HF, Wang WP, Zhang ZW, Li ZD. Distribution and resistance trends of pathogens from urinary tract infections and impact on management. Zhonghua Nan Ke Xue 2003; 9: 690-696.
18. Kahlmeter G. An international suvey of the antimicrobial susceptibility of pathogens from uncomplicated urinary tract infections: the ECO. SENS Project. J Antimicrob Chemother 2003; 51: 69-76.
19. Tolun V, Kucukbasmaci O, Torumkuney- Akbulut D, Catal C, Ang-Kucuker M, Ang O. Relationship between ciprofloxacin resistance and extended spectrum beta-lactamase production in Echerichia coli and Klebsiella pnuemoniae strains. Clin Microbiol Infect 2004; 10: 72-75.
20. Opal SM, Cross AS, Gemski P, Lyhte LW. Aerobactin and alpha-hemolysin as virulence determinants in Escherichia coli isolated from human blood, urine, and stool. J Infect Dis 1990; 161: 794–796.
21. Johnson JR. Virulence Factors in Escherichia coli Urinary Tract Infection. Clin Microbiol Rev 1991; 4: 80-128.
22. Kerenyi M, Allison HE, Batai I, Sonnevend A, Emody L, Plaveczky N, Pal T. Occurrence of hlyA and sheA genes in extraintestinal Escherichia coli strains. J Clin Microbio 2005; 43:2965–2968.

23. Hacker J. Genetic determinants coding for fimbriae and adhesins of extra intestinal Escherichia coli. Curr Top Microbiol Immunol 1990; 151:1–27.
24. Cebula TA, Payne WL, Feng P. Simultaneous identification of strains of Escherichia coli serotype O157:H7 and their shiga like toxin type by mismatch amplification mutation assay-mulitple PCR. J Clin Microbiol 1995; 33:248-250.
25. Moseley SL, Hardy JW, Huq MI, Echeverria P, Falkow S. Isolation and nucleotide sequence determination of a gene encoding a heat stable enterotoxin of Escherichia coli. Infect Immun 1983; 39: 1167-1174.
26. Olive DM. Detection of enterotoxigenic Escherichia coli after polymerase chian reaction amplification with thermostable DNA polymerase. J Clin Microbiol 1989; 27: 261-265.
27. Schmidt H, Beutin K, Karch H. Molecular analysis of plasmid encoded hemolysin of Escherichia coli O157:H7 strain EDL 933. Infect Immun 1995; 63:1055-1061.