International Journal of Life science & Pharma Research

PREVALENCE AND ANTIBIOTIC SUSCEPTIBILITY PATTERN OF MULTI-DRUG RESISTANT *ESCHERICHIA COLI* ISOLATES FROM URINARY TRACT INFECTION (UTI) PATIENTS

MANJULA MEHTA*[±], SONIA BHARDWAJ[±] AND JYOTI SHARMA[±]

[±]Department of Microbiology, Dr Harvansh Singh Judge Institute of Dental Sciences and Hospital, Punjab University, Chandigarh, India

ABSTRACT

Background-*E.coli* is found to be the commonest cause of UTI. However *E. coli* antibiotic resistance has escalated over the past many years. Objective- To provide an update of prevalence of multidrug resistant *E.coli* isolates and their antibiotic susceptibility pattern with special reference to northern region of Chandigarh. Methods- This retrospective study was conducted in the Department of Microbiology, Dr Harvansh Singh Judge Institute of Dental Sciences and Hospital, Panjab University from January, 2010 to December,2011 using urine samples from outdoor patients of UTI from healthcare centre, Panjab University, Chandigarh. A total of 307 urine samples were processed for bacterial culture using standard methods. For these urinary isolates, susceptibility to various antibiotics was checked as per standard CLSI guidelines. Final resistance to various antibiotics from the urinary isolates was analysed. Results- A total of 75 urine samples (41%) showed growth of *E. coli*. Out of these 43 isolates (57%) were multi drug resistant. High level of resistance was seen to ciprofloxacin, amoxicillin, cotrimaxozole, norfloxacin ranging from 70-95% whereas combination drugs (piperacillin +tazobactam),(ceftazidime + clavulinic) along with amikacin, imipenem showed low level of resistance. However Nitrofuratoin was found to be highly sensitive to all urinary isolates of *E.coli* including multidrug resistant strains.Conclusion- *E.coli* was found to be the commonest cause of UTI in our study population. Multidrug resistance was high among the prevalent strains which emphasizes the judicious use of antibiotics.

Key Words: Urinary tract infection, drug resistance, *Esherichia coli.*

INTRODUCTION

Urinary tract infection is one of the most common bacterial infections and Gram- negative bacteria are among the most prevalent bacteria detected from UTI patients(Selvarangan *et al*,2004). The organism is of clinical importance due to its cosmopolitan nature and ability to initiate, establish and cause various kinds of infections. It is one of the most frequently isolated organism from different clinical cases of diarrhea (Olive *et al*;2003, Tobih *et al*;2006). More than 50% of UTI infections in patients is accounted for *E.coli*. (Blomgran et al;2004,Jha and Bapat;200 5). Resistance to antibiotics is highly prevalent in bacterial isolates worldwide, particularly in developing countries The aim of the present study was to investigate urine cultures and to evaluate antibiotic resistance pattern of the most frequent bacterium detected from urine culture in urinary tract infection from the northern part of Chandigarh (India).

METHODS

The study was carried from January 2010 to December 2011 at the Department of Microbiology, Dr Harvansh Singh Judge Institute of Dental Sciences and Hospital, Panjab University, Chandigarh. 307 urine sample from outdoor patients of UTI from healthcare centre, Panjab University, Chandigarh, India were collected , urinalysis done and cultured on blood agar and MacConkey agar incubated at 37^0C overnight. The positive samples were processed using biochemical tests and identification of microorganism according to standard procedure. The standard disk diffusion microbial sensitivity test based on Kirby –Bauer method on Mueller Hinton agar was utilized for all the isolates to assess the antibiotic resistance using antibiotic discs. Multidrug resistant isolates- Isolates resistant to more than two different classes of antibiotics were considered as multi-drug resistant.

RESULTS

Out of the 307 urine samples processed for bacterial culture, 184 (60%) were positive for growth. The frequencies for the pathogens in the positive cases were as follows, most frequent gram-negative bacterium was *E.coli* with75 cases (41%),other gram- negative bacilli including *Klebsiella, Pseudomonas* and *Proteus* were 19 cases (10%). The gram-positive cocci isolated were *Staphylococcus, Enterococcus* 16 cases (8%)[Table-1]. The resistance rate of *E.coli* detected from culture was found to be 53% for augmentin, 44% to amoxicillin, 49% to Norfloxacin,46% to Nalidixic acid and 41% to Ciprofloxacin [Table -2].Urinary *E.coli* isolates were studied and separated according to different age groups [Table-3].The percentage resistance in each age group was seen [Table 4]. 43 *E.coli* isolates (57%) were multidrug resistant.

Table – 1

Distribution of bacteria in UTI

Bacteria	n=184 (60%)
E.coli	75 (41%)
Other GNB (*Klebsiella, Pseudomonas, Proteus*)	19(10%)
GPC (*Staphylococcus spp, Enterococcus.*)	16 (8%)

Table – 2

Resistance pattern of *E.coli* isolates.

Antibiotic	Isolates resistant(n)	%
Augmentin	40	**53 %**
Amoxycillin	33	**44 %**
Norfloxacin	37	**49%**
Nalidixic acid	35	**46 %**
Nitrofuratoin	3	4%
Ciprofloxacin	31	**41%**
Amikacin	2	3%
Gentamicin	22	30%
Ceftazidime +Clavulinic acid	10	13%
Piperacillin +Tazobactam	7	9%
Cefepime	12	16%

Table – 3

Resistance pattern of *E.coli* isolates.

Antibiotic	Isolates resistant(n)	%
Augmentin	40	**53 %**
Amoxycillin	33	**44 %**
Norfloxacin	37	**49%**
Nalidixic acid	35	**46 %**
Nitrofuratoin	3	4%
Ciprofloxacin	31	**41%**
Amikacin	2	3%
Gentamicin	22	30%
Ceftazidime +Clavulinic acid	10	13%
Piperacillin +Tazobactam	7	9%
Cefepime	12	16%

Table 4

% Resistance in *E.coli* isolates according to age.

Age (yrs)	Augment in	Norflox	Nitrofuratoin	Ciprofloxacin	Cefta+Clav	Pipera+Tazo
1-20	25	25	-	-	-	-
21-40	53	53	-	29	5	-
41-60	53	53	-	31	5	-
61-80	55	58	9	54	19	16
>81	67	67	-	67	33	33

% resistance in E.coli isolates according to age

DISCUSSION

The study shows most frequent gram negative bacteria isolated as *E.coli* (41%). This is in similarity with the results of other studies (Jha and Bapat;2005, Astal ZE;2005,Kresken and Hefner;2006,Olewe et al;2008, Mohammadi etal;2010). *E.coli* has widely been implicated in various clinical infections as hospital acquired and community infections as hospital acquired and community infections as reported (Shah *et al*, 2002). Pathogenic isolates of *E.coli* have relatively high potentials of developing resistance (Karlowsky *et al*,2004). High resistance of E.coli to antimicrobial agents tested was observed in this study. High level of resistance was seen to Ciprofloxacin, amoxicillin, Cotrimaxozole, Norfloxacin ranging from 70-95% whereas combination drugs (piperacillin+tazobactam) (Ceftazidime+Clavulinic acid) along with amikacin, imipenem showed low level of resistance. Although fluoroquinolones are among the most effective drugs in treating UTI (Kurutepe *et al*, 2005) diverse studies have revealed increasing resistance to fluoroquinolones. Our study also shows a high level of resistance to Ciprofloxacin. The results of other studies have also revealed that the resistance of *E.coli* to Ciprofloxacin, the most effective drug to UTI is increasing. Astals study, 2005 in China shows increase in resistance from 46.6 to 59.4% during the years 1998-2000. Kurutepe *et al*, 2005 found increase in resistance from 2.9% in 2000 to 11.3% in 2002. Our study shows Nitrofuratoin to be highly sensitive to all

urinary isolates of *E.coli* including multidrug resistant strains. The consistent and high level susceptibility of *E.coli* to nitrofuratoin may be influenced by nitrofuratoins narrow spectrum of activity, limited indication (treatment of acute cystitis),narrow tissue distribution and limited contact with bacteria outside the urinary tract (James *et al*,2002). There is a reluctance to prescribe Nitrofuratoin due to its side effect profile but it stands as a important first –line drug against UTI before culture and sensitivity. Studies in other developing countries have shown that the trend in enteric pathogens is toward increasing antibiotic resistance (Hoge *et al*, 2002). When divided for age groups, most *E.coli* resistance was seen in older population (age more than 61 years). Nitrofuratoin showed low level resistance at all ages. In a study reported from Spain (Ena *et al*, 1995) age more than 64 was found to be a high risk factor for antibiotic resistance against *E.coli*. The reason for the high antibiotic resistance could be previous antibiotic treatment, nosocomial vs community acquired infections, urinary catheterization and urinary tract abnormalities but further studies are required to look at these variables acting as independent risk factors.

CONCLUSION

One can truly affirm that the choice of drugs in the treatment of UTI is quite narrow today due to the widescale resistance that the common UTI pathogens show to drugs which have been used previously. Antimicrobial resistant patterns are constantly evolving, it is a present global public health problem, there is the necessity for constant antimicrobial sensitivity surveillance. This will help clinicians provide safe and effective empiric therapies.

REFERENCES

1. Astal, Z.E,2005. Increasing Ciprofloxacin resistance among prevalent Urinary tract bacterial isolates in the Gaza strip. Singapore Med. J;46:457-459.
2. Blomgran,R; Zheng and Stendahl, O, 2004. .Uropathogenic Escherichia Coli trigger oxygen-dependent apoptosis in human neutrophils through the cooperative effect of type I fimbriae and lipopolysaccharide.Infect.Immuno.72: 4570-4578.
3. Ena J, Amador C, Martinez C et al,R1995.Risk factors for acquisition of urinary tract infections caused by ciprofloxacin resistant E.Coli. Clin.urology;153:117-120.
4. Hoge CW, Gambel JM,Srijan A,Pitarangsi C,Echeverria P,1998. Trends in antibiotic resistance among diarrheal pathogens isolated in Thailand over 15 years. Clin. Infect.Dis.26:341-345.
5. James AK, Laurie J, Clyde T, Mark EJ, Daniel FS,2002. Trends in antimicrobial resistance among urinary tract infection isolates from female outpatients in the United States. Antimicrob Agents Chemother.46(8): 2540-2545.
6. Jha, N and Bapat, S.K,2005. A study of sensitivity and resistance of pathogenic microorganisms causing UTI in Kathmandu Valley. Kathmandu Univ .Med .J;3:123-129.
7. Karlowsky JA, Jones ME, Draghi DC, Thornsbery C, Sahm DF, Volturo GA ,2004. Prevalence of antimicrobial susceptibilities of bacteria isolated from blood cultures of hospitalized patients in the United States in 2002. Ann.Clin.Microbiol.Antimicrobio.3:7.
8. Kresken, M and Hafner, D,2006. Further increase of fluoroquinolone resistance among E.Coli isolates in a central European area. 16 ECC MID , Nice/France, April 1-4, http:// www.blackwell publishing.com/eccmid16/abstract.asp?id=50191
9. Kurutepe, S; Surucuoglu, C; Sezgin, H; Gazi ,G. Gulay and Ozckkaloglu,2005. Increasing antimicrobial resistance in Escherichia Coli

isolates from community acquired urinary tract infections during 1998-2003 in Manisa, Turkey. Jap. J. infect.dis 58:159-161.

10. Olewe OA, Olayeni AB,Eniola KIT and Adeyeba AO,2003. Aetiological agents of diarrhea in children under 5 years of age in Osobgo. Afr.J. Clin . I and Exp.Microbiol 4(3):62-66.
11. Olowe O.A, Okamlawon B.M, Olowe R.A and Olayemi A.B,2008. Antimicrobial resistant pattern of Escherichia coli from human clinical samples in Osogbo, south western Nigeria. African J of Microbio Res; 2, 08-11.
12. Selvarangan;R. Goluszko;J. Singhal, C. Carnoy, S.Moseley and B.Hudson,2004. Interaction of Dr adhesion with collagen type iv is a Critical step in E.Coli renal persistence. Infect. Immun,72:4827-4835.
13. Shah A A, Hasan F and Hameed A ,2002. Study on the prevalence of enterobactericeae in hospital acquired and community acquired infections. Pakistan J Med Res 41:1.
14. Mohammadi M, Gharemi E, Mokhayeni H, Pournia Y and Boroun H,2010 Antimicrobial resistance patterns of E.Coli detected from hospitalized urine culture samples. Asian J of Bio Sci ;3(4): 195-201.
15. Tobih, JE; Taiwo SS, Olowe OA, Olaosun OA, Adejumo SO ,2006. Microbiological profiles of discharging ears in Osogbo, Nigeria.Trop Doc. 36 (3): 165-166.