Original Article

Antibiotic Resistance among Uropathogens

Abhijit Guho[1], Rafiuddin Ahmed[2], Md Ali[3], Liakat Hossain[4], Rummana Sultana[5], Md. Khairuzzaman[6], Lakhsman Chandra Kundu[7]

ABSTRACT:

Introduction: *Urinary tract infections are the most common human infection. Resistance of uropathogen to antibiotic is now a global problem. Variation in resistance pattern of different antibiotic are known to occur in different geographic area as well as in the same country. Given this back ground the aim of this study was to identify common uropathogen and their résistance profile among the patient at the OPD of a private hospital in Khulna.* ***Materials and method****: Appropriate urine specimens of all suspected cases of UTI are processed in the laboratory for detection of significant bacteriuria. Bacterial uropathogens isolated were identified by standard biochemical tests and antibiotic susceptibility test to antibiotics was carried out on them by using Kirby-Bauer disc diffusion technique.* ***Results:*** *Among 77 uropathogen, Escherichia coli accounted for 73 (94.80%) of all isolate. Meropenem-73(100%), netilmycins-71(97.25%), amoxicillin-clavulanic acid-67(91.77%), gentamycin-64(87.66%), nitrofuantoin-63(86.29), levofloxacin-(83.55%) and ceftazidime-59 (80.81%) showed sensitivity to E. coli. In contrast Nalidixic acid- 62(84.93%), Cefachlor-62(84.93%) Cefuroxime- 47(64.38), Cefixime- 45(61.64%) and ciprofloxacin- 34(46.57%) were resistant to E. coli.* ***Conclusion:*** *Regular monitoring of uropathogen and antibiotic susceptibility is needed to determine the appropriate empirical antibiotic treatment and overcoming drug resistance.*

Key words: *Urinary tract infection (UTI); antibiotic resistance; Escherichia coli (E.coli).*

(The Insight 2020; 3(1): 3-7)

INTRODUCTION:

Urinary tract infections (UTIs) refer to any type of urothe-lial inflammatory response resulting from the invasion of the urinary tract by microbial pathogens.[1,2] They are considered to be the most common bacterial infections worldwide, whether in the community or hospital setting.[3,4,5] Appropriate empirical treatment of urinary tract infections (UTIs) is important for successful treatment and prevention of complications. However, with the increasing prevalence of antibiotic-resistant urinary pathogens, the selection of an appropriate empirical agent is increasingly difficult. This is reflected in 2010 clinical practice guidelines which recommend using nitrofurantoin as a first-line agent in place of cotrimoxazole, owing to a rise in the occurrence of organisms resistant to the latter. [6,7] Resistance to other antimicrobials used in the treatment of UTIs, particularly fluoroquinolones, is also increasing, as is the prevalence of extended-

1. Assistant Professor, Department of Microbiology, Sheikh Sayera Khatun Medical College, Gopalganj
2. Professor, Department of Microbiology, Sheikh Sayera Khatun Medical College, Gopalganj
3. Assistant Professor, Department of Pathology, Sheikh Sayera Khatun Medical College, Gopalganj
4. Professor & Principal. Sheikh Sayera Khatun Medical College, Gopalganj.
5. Junior Consultant (Gynae and Obs), Bangladesh National Parliament Secretariat, Dhaka.
6. Assistant Professor, Department of Pediatrics, Sheikh Sayera Khatun Medical College, Gopalganj
7. Associate Professor (Pediatric Nephrology), Sheikh Sayera Khatun Medical College, Gopalganj

spectrum-beta-lactamase (ESBL)-producing Enterobacteriaceae and multidrug-resistant (MDR) Pseudomonas aeruginosa.

METHODS AND MATERIALS:

A random group of 200 symptomatic patients were included in our study. Patients who had used antibiotic were excluded from the study. Midstream urine sample was collected in the laboratory. Those having pus cell10/HPF were considered as significant pyuria. All positive samples were further subjected to urine culture and antibiotic susceptibility test. Uncentrifuged urine samples were inoculated on Blood agar, MacConkey agar and Nutrient agar at 37^{o}C for overnight. Colonies were identified by standard biochemical test. Antibiotic susceptibility was done using Kirby Bauer method. Sensitivity of 15 drugs, namely Cefachlor, Cefotaxime, Cefixime, Cefuroxime, Ceftazidime, Nitrifurantoin, Nalidixic acid, Gentamycin, Ciprofloxacin, Levofloxacin, Ceftriaxone, Meropenem, Amoxicillin-Clavulanic acid, Netilmicin and Mecillinam were tested. Data were analyzed by statistical software SPSS version 20.

RESULTS:

Out of 200 patients tested 77 showed positive UTI based on microscopic enumeration of leucocytes and quantitative urine culture. Prevalence of UTI was found to be higher in the age group 15-49 in females and above 50 in males. Out of 77 patients the prevalence of E.coli was 73(98.40%), others are Pseudomonas 3(3.89%) and Klebsiella (1.29%) respectively.

Table-1: Gender distribution and growth of uropathogen

Sex	No of sample	Growth (%)	No growth (%)
Male	43	12(28%)	31(72%)
Female	157	65(41%)	92(59%)
Total	200	77(38.5%)	123(61.5%)

Table-2: Pattern of bacterial uropathogens isolated from urine culture

Organism	Frequency	Percent
Escherichia coli	73	94.80
Pseudomonas aeruginosa	3	3.90
Klebsiella pneumonia	1	1.30

Table-3: Antibiotic susceptibility profile of uropathogen isolated from symptomatic UTI patient

Uro-isolates / Drugs	Escherichia coli (N-73)			Pseudomonas aeruginosa (N-3)			Klebsiella pneumonia (N-1)		
Antibiotic	S	I	R	S	I	R	S	I	R
Cefachlor	4	7	62	0	0	3	0	0	1
Cefotaxime	29	20	24	0	1	2	0	0	1
Cefixime	12	16	45	0	0	3	0	0	1
Ceftriaxone	48	9	16	0	0	3	0	0	1
Cefuroxime	6	20	47	0	0	3	0	0	1
Ciprofloxacin	15	24	34	0	0	3	0	0	1
Levofloxacin	36	25	12	1	0	2	1	0	0
Amoxicillin-Clavulanic acid	52	15	6	0	0	3	0	0	1
Meropenem	73	0	0	2	0	1	1	0	0

Netilimicin	66	5	2	0	0	3	0	0	1
Nitrofurantoin	41	21	11	0	0	3	0	0	1
Mecillinam	31	31	11	0	0	3	0	0	1
Nalidixic acid	1	10	62	0	0	3	0	0	1
Gentamycin	63	1	9	0	0	3	1	0	0
Cefatzidime	45	14	14	1	0	2	1	0	0

E.coli was the most common (94.80%) uropathogen in our study, followed by Pseudomonas and Klebsiella. Antibiotic resistance pattern of isolates are shown in table-3. Most of the organism showed moderate resistance to Nalidixic acid, Cephachlor, Cefuroxime, Cefixime and Ciprofloxacin.

E coli showed susceptibility to Meropenem-73(100%), Netilmycin-71(97.25%), Amoxicillin-Clavulanic acid- 67(91.77%), Gentamycin-64(87.66%), Nitrofurantoin-62 (86.29%), Levofloxacin-61(83.55%) and Ceftazidime-59(80.81%). Pseudomonas aeruginosa showed susceptibility to Meropenem (2/3, 66.66%), Ceftazidime (1/3, 33.33%), Cefotaxime (1/3, 33.33%), Levofloxacin (1/3, 33.33%) and resistance to Cefachlor, Cefixime, Cefuroxime, Nitrofurantoin, Nalidixic acid, Gentamycin, Ciprofloxacin, Ceftriaxone, Amoxycillin -clavulanic acid, Netilimicin and Mecillinam.

Our findings indicate that Meropenem is the most effective anti-microbial agent. For most of the drugs, Pseudomonas and Klebsiella showed considerable resistance.

After the combination of sensitive and intermediate readings, the most sensitive antibiotics were Meropenem, Netilmycin, Amoxicillin-Clavulanic acid, Gentamycin, Nitrofurantoin, Levofloxacin and Ceftazidime. Data showed that uropathogen showed lowest resistance to Meropenem and highest resistance to Nalidixic acid and Cefachlor.

DISCUSSION:

Out of 200 patients tested 77 showed positive UTI based on microscopic enumeration of leucocytes and quantitative urine culture. Prevalence of UTI was found to be higher in the age group 15-49 in females and above 50 in males. It has been reported that women between age group 20-40years, 25% to 35% have had UTI which correlates to our study.[3] In a study conducted in Meerut city, India it was found that UTI is more common in females than males (Females 73.57% between the age group of 26-36 years).[8] In males, elderly males above 50 years showed higher prevalence of UTI.[8]

Out of 77 culture positive cases, the prevalence of E.coli was 73(94.80%), others are Pseudomonas 3(3.90%) and Klebsiella 1(1.30%) respectively. E.coli was the most common uropathogen in our study which is supported by several previous study.[9] A study in Kathmandu, E.coli was found as the most predominant uropathogen (81.3%).[10]

Antibiotic resistance pattern of isolates are shown in table-3. Most of the organism showed moderate resistance to Nalidixic acid, Cephachlor, Cefuroxime, Cefixime and Ciprofloxacin.

E coli showed susceptibility to Meropenem-73(100%), Netilmycin-71(97.25%), Amoxicillin-Clavulanic acid- 67(91.77%), Gentamycin-64(87.66%), Nitrofurantoin-62(86.29%), Levofloxacin-61(83.55%) and Ceftazidime-59(80.81%). Pseudomonas aeruginosa showed susceptibility to Meropenem (2/3, 66.66%), Ceftazidime (1/3, 33.33%), Cefotaxime (1/3, 33.33%), Levofloxacin (1/3, 33.33%) and resistance to Cefachlor, Cefixime, Cefuroxime, Nitrofurantoin, Nalidixic acid, Gentamycin, Ciprofloxacin, Ceftriaxone, Amoxycillin -clavulanic acid, Netilimicin and Mecillinam.

However our findings indicate that Meropenem is the most effective anti-microbial agent. In Uganda and other developing countries high level of resistance to most commercially available antibiotics are found.[11] For most of the drugs,

Pseudomonas and Klebsiella showed considerable resistance.

After the combination of sensitive and intermediate readings the most sensitive antibiotics were Meropenem, Netilmycin, Amoxicillin-Clavulanic acid, Gentamycin, Nitrofurantoin, Levofloxacin and Ceftazidime. Data showed that uropathogen showed lowest resistance to Meropenem and highest resistance to Nalidixic acid and Cefachlor.

Some factors which largely contribute to the antibiotic resistance are dispensing of antibiotic without a prescription, self-medication of antibiotic, antibiotics sold or prescribed by non-qualified or relatively less qualified health workers, wide spread and inadequate doses of antibiotic, use of broad spectrum antibiotics where antibiotic is not necessary, long duration of antibiotic, use of animal antibiotic.[12] All these factors have resulted in the development of progressive antibiotic resistance in the microbial ecosystem in Bangladesh.

CONCLUSION:

Antimicrobial resistance is one of the most serious global health threats in this century including our country. This study reinforces the need for continuous local surveillance of bacterial antimicrobial resistance. To maintain useful use of drugs in Bangladesh, improved surveillance of the emergence of resistance, better regulation of antibiotic and better education of public, doctors and veterinarians are essential.

REFERENCES:

1. Dielubanza EJ, Schaeffer AJ. Urinary Tract Infections in women. Med. Clin. North Am 2011, 95:27–41.
2. Foxman B: Epidemiology of Urinary Tract Infections: Incidence, Morbidity and Economic Costs. Am J Med 2002; 113(Suppl 1A):5S–13S.
3. Ronald AR, Nicolle LE, Stam E, Krieger J, Warren J, Schaeffer A, et. Al. Urinary tract infection in adults: research priorities and strategies. Int. J. Antimicrob Agents. 2001; 17:343–8.
4. Olson RP, Harrell LJ, Kaye KS: Antibiotic resistance in urinary isolates of Escherichia coli from college women with urinary tract infections. Antimicrob Agents Chemother. 2009; 53: 1285–6.
5. Steinke DT, Seaton RA, Phillips G, MacDonald TM, Davey PG. Prior Trimethoprim use and Trimethoprim-resistant urinary tract infection: a nested case–control study with multivariate analysis for other risk factors. J Antimicrob Chemother 2001, 47:781–7.
6. Gupta K, Hooton TM, Naber KG, Wullt B, Miller LG, Moran GJ, et. Al. International clinical practice guidelines for the treatment of acute uncomplicated cystitis and pyelonephritis in women: an update by the Infectious Diseases Society of America and the European Society for Microbiology and Infectious Diseases. Clin Infect Dis. 2010; 52:e103–e120. doi:10.1093/cid/ciq257.
7. Sanchez GV, Master RN, Bordon J. Trimethoprim-Sulfamethoxazole May No Longer be Acceptable for the Treatment of Acute Uncomplicated Cystitis in the United States. Clin Infect Dis. 2011; 53:316–317. doi:10.1093/cid/cir345.
8. Foxman B, Barlow R, D'Arcy H, Gillespie B, Sobel JD. Urinary Tract Infection. Annals of Epidemiology. 2000; 10, 509-515.
9. Okonko I, Ijandipe L, Ilusanya O, Donbraye-Emmanuel O, Ejembi J, Udeze A, et. Al. Incidence of urinary tract infection (UTI) among pregnant women in Ibadan, SouthWestern Nigeria. African Journal of Biotechnology. 2009; 8(23):6649-6657.
10. Kamenski G, Wagner G, Zehetmayer S, Fink W, Spiegel W, Hoffmann K. Antibacterial resistances in uncomplicated urinary tract infections in women: ECO·SENS II data from primary health care in Austria. BMC Infect Dis. 2012; 12: 222-224.
11. Majumdar S, Singh S. Resistant Escherichia coli and Klebsiella Spp. in Community-Acquired Urinary Tract Infections in Rural Kanpur, India. J Clin Diagnos. 2012; 6: 978–981.

12. Mandal J, Acharya NS, Buddhapriya D, Parija SC. Antibiotic resistance pattern among common bacterial uropathogens with a special reference to ciprofloxacin resistant Escherichia coli. The Indian journal of medical research. 2012; 136: 842-844.