ORIGINAL ARTICLE

NCRTH BENGAL MEDICAL COLLEGE JOURNAL [2018], VOL., 4, No. 2 : 05-09

Bacterial Isolates and Antibiotic Susceptibility Pattern in Patients with symptomatic Urinary Tract Infection at out Patient settings in Sirajganj, Bangladesh

*Md. Shariful Haque,[1] Shaheen Akter,[2] S M Monowar Ali,[3]
Md. Azizul Hoque,[4] Harun-Ur-Rashid[5]

ARTICLE INFO
Article history:

Received: 04 August 2017
Accepted: 22 December 2017

Online:
www.nbmc.ac.bd

Keywords:
Antibiotic resistance,
Uropathogens, Escherichia coli

ABSTRACT

Introduction: *Urinary Tract Infection (UTI) is one of the commonest infections requiring antibacterial treatment. Antibiotic resistance is rising worldwide and a global concern. Knowledge on local spectrum of uropathogens and antibiotic susceptibility may guide selecting appropriate antibiotics and overcoming bacterial resistance.* ***Methods:*** *We have conducted a cross- sectional study on UTI among symptomatic patients at Nephrology OPD in 250 bed General Hospital, Sirajganj. All symptomatic patients having significant pyuria (pus cells 10/HPF) and not on antibacterial drugs were advised for urine culture and sensitivity test done at North Bengal Medical College Hospital, Sirajganj.* ***Results:*** *Among 75 UTI cases 30 (40%) were male and 45 (60%) female. Age ranging was from 4.5 years to 85. Mean age 39.33 ±19.23. Among 75 positive culture Escherichia coli 73 (97.34%), one Klebsiella (1.33%) and one Staphylococcus aureus (1.33%) were isolated. Amikacin 64 (87.67%), imipenem 61 (83.56%), chloramphenicol 55 (77.46%) and nitrofurantoin 54 (73.97%) showed sensitivity to E. coli. In contrast erythromycin 69 (95.24%), cephradin 61 (89.55%) and ceftazidim 60 (88.73%) were resistant to E. coli.* ***Conclusion:*** *Periodic surveillance of uropathogens and antibiotic susceptibility is needed for effective empirical treatment of UTI and overcoming antibiotic resistance.*

[1.] *Assistant Professor, Department of Nephrology, Shaheed M. Monsur Ali Medical College, Sirajganj*
[2.] *Associate Professor, Department of Pathology, North Bengal Medical College, Sirajganj*
[3.] *Associate Professor, Department of Medicine, Shaheed M. Monsur Ali Medical College, Sirajganj*
[4.] *Associate Professor, Department of Endocrinology, Shaheed Ziaur Rahman Medical College, Bogura*
[5.] *Professor of Nephrology and President, Kidney Foundation, Bangladesh*

***Corresponding author:** ✉ sharifuldr@gmail.com*

INTRODUCTION

Urinary tract infection (UTI) is one of the most common bacterial illnesses in adults, and is one of the most common indications for antibiotics.[1, 2] Women have a one-in-three lifetime chance of developing a UTI[3] about 50 times more than for men.[4] UTI may be symptomatic or asymptomatic, complicated or uncomplicated, upper (pyelonephritis) or lower (cystitis, prostatitis, urethritis) and recurrent (relapse and reinfection). Antibacterial treatment is not indicated always in asymptomatic UTI. Antibiotics should only be started in patients with symptomatic UTI or asymptomatic patients at high risk of developing complications. Antibiotic is recommend in asymptomatic bacteriuria (asymptomatic UTI) in pregnancy as 20-30 fold increased risk of developing pyelonephritis during pregnancy.[5] The World Health Organization (WHO) and the CDC have implicated antibiotic use in food animals as a contributor to the emerging threat of antibiotic resistant infections[6] Preliminary research indicates that poultry may be contaminated with resistant bacteria that cause urinary tract infections.[7] Updated Infectious Disease Society of American (IDSA) Guidelines 2010 emphasize the importance of "collateral damage"- a term describing ecological adverse effects of antimicrobial therapy, such as the selection of drug-resistant organisms and colonization or infection with multi drug resistant organisms, has been associated with use of broad spectrum cephalosporins and fluoroquinolones.[8,9] Antibiotic for a UTI in primary care acquire resistant bacteria, and these may persist for up to 12 months.[10] The microbial spectrum of uncomplicated cystitis and pyelonephritis consists mainly of *Escherichia coli* (75%–95%), with occasional other species of *Enterobacteriaceae*, such as *Proteus mirabilis* and *Klebsiella pneumoniae,* and *Staphylococcus saprophyticus.*[11,12] Therefore, local antimicrobial susceptibility patterns of *E. coli* in particular should be considered in empirical antimicrobial selection for uncomplicated UTIs. Since the resistance patterns of *E. coli* strains causing uncomplicated UTI varies considerably between regions and countries, a specific treatment recommendation may not be universally suitable for all regions or countries. Knowledge on local uropathogens drug susceptibility pattern is helpful to choose appropriate antibiotics and overcoming drug resistance. Many first line antibiotics for UTI are already resistant. Amoxicillin or ampicillin should not be used for empirical treatment given the relatively poor efficacy, as discussed in the 1999 guidelines[13] and the very high prevalence of antimicrobial resistance to these agents worldwide. [11-13]

METHODS

Patients attended at Nephrology OPD of General Hospital, Sirajganj from June 2015 to May 2016 with symptoms of Urinary Tract Infection (UTI) (fever and loin pain in upper UTI/Pyelonephritis and LUTS (Lower Urinary Tract Symptoms) i.e. dysuria, frequency, urgency, strangury for Lower UTI) were sent for urine Routine Microscopic Examination (RME). Those having urinary pus cells 10/HPF were considered having significant pyuria and asked for culture and sensitivity test of clean catch MSU (Mid-Stream Urine) done at North Bengal Medical College Hospital (NBMCH), Sirajganj. Antiobiotic sensitivity was tested by disk diffusion method. Patients on antibiotics, or antibiotics taken within 72 hours were excluded. Reports outside NBMCH were not included. 4 reports showing no growth (sterile pyuria) were not included. Sensitivity of 23 drugs Azythromycin, ceftriaxone, ceftazidime, chloramphenicol, nitrofurantoin, cefixime, amoxi-cillin+ clavulanic acid, cephalexin, cefuroxime, ciprofloxcin, imipenem, levofloxacin, tetracycline, doxycycline, clindamycin, linezolid, erythromycin, gentamicin, amikacin, cephradine, cotrimoxazole, pivmecillinam, moxifloxacin were tested. Less used amoxycillin, aztreonam, colistin, netilmicin, vancomycin, fusidicacid, gatifloxacin infrequently tested and were not analyzed in this study. Data was compiled and analyzed in SPSS 20. Means were compared by one way ANOVA.

RESULTS

Total 75 cases were analyzed. Age range was 4.5 - 85 years. Males were 30 (40%) and females 45 (60%) in number. Mean age of participants was 39.33 ±19.23. Mean age of male was 44.13 years, and female 36.13. (Table I) Most of the participants belonged to 21-40 years (25, 33.3%) and 41-60 years (25, 33.3%). Some (14, 18.7%) participants were below 20, 10 (13.33%) were within 61-80, and 1(1.33%) above 80 (Table II). *Escherichia coli* was isolated from 73 cases (97.34%). Only 2 cases belonged to other species 1 *Klebsiella* (1.33%) and 1 *Staphylococcus aureus* (1.33%) were isolated.

Susceptibility patterns of different drugs to *E. coli* are shown in Figure 1 and Table III. Highest rate of sensitivity of *E. coli* was to amikacin 64 (87.67%) followed by imipenem 61 (83.56%), chloramphenicol 55 (77.46%) and nitrofurantoin 54 (73.97%). Maximum resistance against erythromycin was 69 (95.24%) followed by cephradin 61 (89.55%) and ceftazidim 60 (88.73%) in *E. coli.* Azithromycin was 23.3% sensitive and 71.2% resistant to *E. coli.* Cephalosporin antibiotics ceftriaxone is 47.22% sensitive, ceftazidime is 8.45%, cefuroxim 19.18%, cefixime is 14.50%, cefalexin 12.67%, and cephradine 10.45% sensitive to *E. coli.* Amoxyclav was 19.12% sensitive (out of 68) and 76.47% resistant to *E. coli.* Among fluroquinolones, ciprofloxacin was 38.89%, levofloxacin 44.44% and moxifloxacin 52.38% sensitive to *E. coli.*

Staphylococcus aureus was sensitive to ceftriaxone, chloramphenicol, nitrofurantoin, netilmicin, cephalexine, imipenem, tetracycline, clindamycin, linezolid, gentamicin, amikacin and resistant to azithromycin, ceftazidime, cefixime, amoxyclav, cefuroxime, cloxacillin, ciprofloxacin, levofloxacin, moxifloxacin, gatifloxcin, doxycyclin, erythromycin, cephradin, cotrimoxazole, and mecillinam.

Klebsiella was sensitive to imipenem, nitrofurantoin, doxycycline, tetracycline, gentamicin, amikacin, and was resistant to azithromycin, ceftriaxone, ceftazidime, cefixime, amoxyclav, cefuroxime, ciprofloxacin, levofloxacin, clindamycin, linezolid, erythromycin, cephradine, cotrimoxazole, and mecillinam.

Table I: Sex and age frequency

	Number	Age (mean)
Male	30 (40%)	44.13
Female	45 (60%)	36.13
Total	**75 (100%)**	**39.33**

Table II: Number of populations in different age groups

Age group	Number	Percentage %
0-20	14	18.68
21-40	25	33.33
41-60	25	33.33
61-80	10	13.33
81	1	1.33
Total	**75**	**100%**

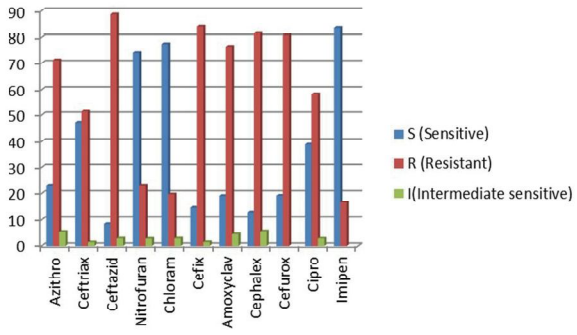

Figure 1 (a): Susceptibility pattern (%) of different antibiotics to *E. coli.*
S- Sensitive, R- Resistant, I- Intermediate sensitive

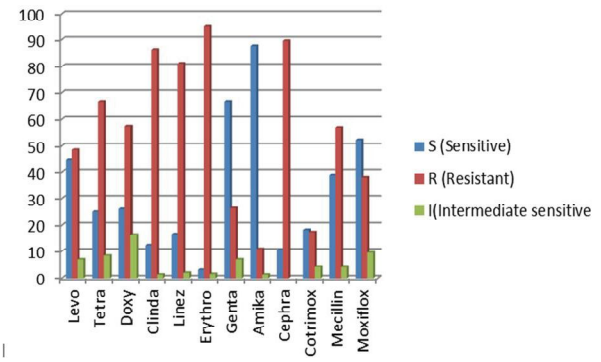

Figure 1 (b): Susceptibility pattern (%) of different antibiotics to *E. coli.*

S- Sensitive, R- Resistant, I-Intermediate sensitive

Table III: Susceptibility pattern (%) of different drugs to *E. coli*

Drugs	S (Sensitive)	R (Resistant)	I (Intermediate)
Azithro	23.3	71.2	5.5
Ceftriax	47.22	51.39	1.39
Ceftazid	8.45	88.73	2.82
Nitrofura	73.97	23.29	2.74
Chloram	77.46	19.72	2.82
Cefix	14.5	84.05	1.45
Amoxycl	19.12	76.47	4.41
Cephalex	12.67	81.7	5.63
Cefurox	19.18	80.82	
Cipro	38.89	58.33	2.78
Imipen	83.56	16.44	
Levo	44.44	48.62	6.94
Tetra	25.0	66.67	8.33
Doxy	26.03	57.43	16.44
Clinda	12.33	86.3	1.37
Linez	16.67	81.25	2.08
Erythro	3.17	95.24	1.59
Genta	66.67	26.39	6.94
Amika	87.67	10.96	1.37
Cephra	10.45	89.55	
Cotrim	18.31	17.46	4.23
Mecillin	38.89	56.94	4.17
Moxiflox	52.38	38.1	9.52

S- Sensitive, R- Resistant, I- Intermediate sensitive

DISCUSSION

Urinary Tract Infection (UTI) is more common in females. Among culture proven 75 UTI cases 45 (60%) were female, 30 (40%) male in our study. *Escherichia coli* are the dominant causative organism worldwide leading to UTI. In our study single colony bacterial isolation were 97.34% for *E. coli*, one *Klebsiella* (1.33%) and one *Staphyloccus aureus* (1.33%). *E. coli* isolation in this study is very high (97.34%). Uncomplicated upper and lower UTI are more often caused by *E. coli*, present in 70-95% and *Staphyloccus saprophyticus*, 5% to 20%. *Proteus mirabilis* 1-2% and *Klebsiella spp* 1-2%. In complicated UTI *E. coli* contribute 21-54%.[14] It is notable that we are dealing with symptomatic UTI, while other studies were prevalence study includes consecutive cases of symptomatic and asymptomatic UTI. Nevertheless, our results may not be representative of prevalence in community since consecutive sample was not taken as many patients could not afford urine culture sensitivity study.

In a recent study at Cox's Bazar Medical College *E. coli* was sensitive to imipenem (100%), followed by ceftriaxone (65%), azithromycin (65%) and ciprofloxacin shows 60%.[15] In another study at Indira Gandhi Medical College & Research Institute, Paducherry, India on antibiotic resistance against *E. coli* amoxicillin-clavulanic acid (74.4%), ceftriaxone (71.4%), cefuroxime (72.2%) and cotrimoxazole (64.2%) resistance was documented. While isolates were sensitive to amikacin (82%), nitrofurantoin (82.1%) and imipenem (98.9%).[16] In our study, we observed high rate of sensitivity to amikacin (87.67%) followed by imipenem (83.56%), chloramphenicol (77.46%) and nitrofurantoin (73.97%). While erythromycin (95.24%), cephradine (89.55%) and ceftazidime (88.73%) showed higher resistance against *E.coli*. Aminoglycoside antibiotic amikacin 87.67% and gentamicin 66.67% sensitive.

Most of the studies do not categorize sensitive and intermediate sensitive entity in antibiogram. Sensitivity would be higher in this study if we combine sensitive and intermediate sensitive as one.

CONCLUSION

Epidemiology of uropathogens and drug susceptibility is changing worldwide. Regular drug susceptibility test could aid in selecting appropriate empirical antibiotic while decreasing drug resistance. Large scale multicentre study involving more patients should be done often to know uropoathogens and drug susceptilibilty pattern in Sirajganj.

Conflicts of Interest: None

REFERENCES

1. Zalmanovici A, Green H, Paul M, Yaphe J, Leibovichi L. Antimicrobial agents for treating uncomplicated urinary tract infection in women. Cochrane Database Syst Rev. 2010; 10: CD007182. doi: 10.1002/14651858. CD00 7182.pub2.
2. Nicolle LE. Epidemiology of urinary tract infections. Clin Microbiol News. 2002; 24: 135–140.
3. Henry DC, Nenad RC, Iravani A. Comparison of sparfloxacin and ciprofloxacin in the treatment of community-acquired acute uncomplicated urinary tract infection in women. Sparfloxacin Multicenter Uncomplicated Urinary Tract Infection Study Group. Clin Ther. 1999; 21: 966–981.
4. Margariti PA, Astorri AL, Mastromarino C. Urinary tract infections: risk factors and therapeutic trends. Recenti Prog Med. 1997; 88: 65–68.
5. Kincaid-Smith P, Bullen M. Bacteriuria in pregnancy. Lancet. 1965; 1: 395–399.
6. CDC, Antibiotic Resistance Threats in the United States, 2013, www.cdc.gov/drug-resistance/threat-report-2013/; World Health Organization (WHO), "Drug resistance," WHO, 2015, http://www.who. int/ drug resistance/use/en/.
7. Nordstrom L, Liu CM, Price LB. "Foodborne urinary tract infections: a new paradigm for antimicrobial-resistant food borne illness," Frontiers in Microbiology, 29, 2013; p. 1–25.
8. Paterson DL. "Collateral damage" from cephalosporin or quinolone antibiotic therapy. Clin Infect Dis 2004; 38 (Suppl. 4): S341–S345.
9. Gupta K, Hooton TM, Naber KG. International clinical practice guidelines for the treatment of acute uncomplicated cystitis and pyelonephritis in women. A 2010 update by the Infectious Disease Society of America and the European Society for Microbiology and Infectious Disease. Clin Infect Dis. 2011; 52: e103-e120.
10. Costelloe C, Metcalfe C, Lovering A. Effect of antibiotic prescribing in primary care on antimicrobial resistance in individual patients: systematic review and meta-analysis. BMJ. 2010; 340: c2096. doi: 10:1136/bmj.c2096
11. Kahlmeter G. An international survey of the antimicrobial susceptibility of pathogens from uncomplicated urinary tract infections: the ECO.SENS Project. J Antimicrob Chemother. 2003; 51: 69–76.
12. Zhanel GG, Hisanaga TL, Laing NM. Antibiotic resistance in Escherichia coli outpatient urinary isolates: final results from the North American Urinary Tract Infection Collaborative Alliance (NAUTICA). Int J Antimicrob Agents. 2006; 27: 468–475.
13. Warren JW, Abrutyn E, Hebel JR, Johnson JR, Schaeffer AJ, Stamm WE. Guidelines for antimicrobial treatment of uncomplicated acute bacterial cystitis and acute pyelonephritis in women. Guidelines from the Infectious Diseases Society of America (IDSA). Clin Infect Dis. 1999; 29: 745–758.
14. Hooton T. Bacterial Urinary Tract Nephrology Infections. In:Johnson RJ, Feehally J, Floege J, editors. Comprehensive Clinical Nephrology. 5th ed. Elsevier, 2015; p. 633.
15. Khan RA, Karim MF. Urinary Tract Infection and Drug Susceptibility Pattern in Patients of a Medical College Hospital in Bangladesh. J Enam Med Col. 2014; 4(1): 21-25.
16. Niranjan V, Malini J. Antimicrobial Resistance Pattern in *E. coli* causing urinary Tract Infection among in patients. Indian J Med Res. 2014; 139: 945-948.