

Prevalence and Antibiotic Susceptibility Pattern of Microbial Agents That Cause Urinary Tract Infection

¹Mohammad Reza Sharif, ²Javad Alizargar and ³Alireza Sharif

¹Department of Pediatrics, Kashan University of Medical Sciences, Kashan, Iran

²Student Research Committee, Kashan University of Medical Sciences, Kashan, Iran

³Department of Infectious Disease, Kashan University of Medical Sciences, Kashan, Iran

Abstract: Urinary tract infection (UTI) accounts for a large part of antibacterial drug consumption. Antibiotic resistance, due to irrational use, is increasing every day, especially in the countries with non-restricted policies against wide consumption of antibiotics and no precise plans, like Iran. This investigation was therefore designed to determine the prevalence and antibiotic susceptibility pattern of microbial agents that cause UTI in patients who are suspected to have UTI. The sensitivity of the strains against various antibiotics was determined by using antibiotic sensitivity discs; namely imipenem, gentamicin, ciprofloxacin and co-trimoxazole. The most common pathogen was *Escherichia coli* (45.2%) and *Klebsiella* (18%). Our study showed 8.5%, 29.6% and 40.9% resistance rate of *E. coli* to Imipenem, ciprofloxacin and co-trimoxazole. Overall bacterial resistance rate to imipenem, gentamycin, ciprofloxacin and co-trimoxazole was high especially in mixed species cultures. Resistance of co-trimoxazole needs more attention because it is more than other studies and shows unwise use of this antibiotic.

Key words: Drug Resistance • Microbial • Urinary Tract Infections • Urology

INTRODUCTION

Urinary tract infection (UTI) can cause fever and is one of the most prevalent community acquired infections [1]. A UTI is a bacterial infection of any part of the urinary tract. It is an inflammatory disease that makes changes to normal function of kidneys and urinary tract. UTIs are among the most common bacterial infectious diseases and cause high mortality and morbidity in clinical practice. They cause huge medical costs every year. It ranks the highest among the prevalent reasons one might have to seek medical attention [2-4].

Urethritis is the most manifestation of UTI, but cystitis and pyelonephritis may also occur. More than 90% of UTIs are caused by certain types of bacterial species that are part of the Urinary tract. *E. coli* is the most prominent cause of bacterial UTIs [5]. It approximately accounts for the infection of 75 to 90% of uncomplicated patients. While complicated ones show a broader bacterial spectrum as the cause of infection [6].

UTI affects all people from all ages, from neonate to geriatric age. It is also the most prevalent bacterial infection in women. It usually happens between the ages of 16-35. 10% of women are infected every year and 60% of women are infected at least once in their lives [7].

UTIs account for a large part of antibacterial drug consumption. Antibiotic resistance, due to irrational use, is increasing every day, especially in the countries with non-restricted policies against wide consumption of antibiotics and no precise plans, like Iran [8, 9].

UTI possesses one of the most serious health threats in terms of antibiotic resistance and also in having high recurrence rates [10]. The treatment of UTI is empirical in most cases, so it is worth to investigate the epidemiology and antimicrobial susceptibility of the causing organisms. These kinds of studies help to reduce antibiotic treatment failure for UTI due to decreasing antimicrobial resistance. Temporal and local variables can modify these data so they need to be constantly re-evaluated [11].

This investigation was therefore designed to determine the prevalence and antibiotic susceptibility pattern of microbial agents that cause UTI in patients with are suspected to have UTI.

MATERIALS AND METHODS

Patients with the suspicion of UTI, referring to Shahidbeheshti Hospital Urology Clinic during 2010-2011 included in our study. Patients who consented entered our study. Age and sex of the patients were recorded. A 50 µl of morning midstream urine samples from each of the subjects was streaked on cystine lactose electrolyte deficient agar medium. The plates were incubated overnight at 37°C. Pure, isolated colonies of each type was separately cultured and characterized.

The sensitivity of the strains against various antibiotics was determined by using antibiotic sensitivity discs; namely imipenem 10 mcg, gentamicin 50 mcg, ciprofloxacin 5 mcg and co-trimoxazole 25 mcg. Antimicrobial susceptibility was evaluated by the Kirby-disk diffusion method in guide lines of Clinical and Laboratory Standards Institute [12].

RESULTS

From 221 cultures, 157 had showed significant bacterial growth and entered our study. 110 (70%) with mean age of 40.1 (SD=11.3) and 47 were male with the mean age of 31 (SD=4.4). the most common pathogen was *Escherichia coli* (70 isolates, 45.2%) and *Klebsiella* sp (20 isolates, 18%). Frequency and antibiotic susceptibility pattern of microbial agents that cause UTI in patients suspected to have UTI are shown in Table 1.

DISCUSSION

UTI rank among the most prevalent cause of infection in human. The pattern of antimicrobial resistance of the microorganisms causing UTI infections vary in their susceptibility to antimicrobials from place to place and from time to time [13, 14].

E. coli was the most prevalent cause of UTI in our study (45.2%). It is in accordance with the 50%, 56.6%, 69.2%, 44.1% and 43% rate of *E. coli* contamination rate of samples in 5 hospitals in Kathmandu [15]. *Klebsiella* sp, *S. aureus* and *Pseudomonas aeruginosa* are rated after *E. coli* in both studies.

Our study showed 8.5%, 29.6% and 40.9% resistance rate of *E. coli* to Imipenem, ciprofloxacin and co-trimoxazole. Ahmed *et al.* [16] conducted a study on sensitivity pattern of urinary tract pathogens to anti-microbial drugs in Bangladesh and found these rates as 6.02%, 29.33% and 47.41%. These rates are high in both studies but in accordance with each other. Regarding resistance rate of *E. coli* to gentamycin, the results of our study seems to be very high. In the study of Jha and Bapat [15] the resistance rate was 7.5% while our results show a 22.6% resistance rate.

The resistance rate of *Klebsiella* sp to imipenem, gentamycin, ciprofloxacin and co-trimoxazole is 40%, 35%, 25% and 20% in our study. Sharma *et al.* [17] conducted a study which resistance rate of *Klebsiella* sp to all named antibiotics was 33.3%. The rates are in a range of less than 50% in both studies. These rates are all less than 50%, so all these antibiotics can be used for UTI patients after a susceptibility test.

Table 1: Frequency and Antibiotic Susceptibility Pattern of Microbial Agents that Cause UTI in Patients Suspected to Have UTI

Organism		Imipenem	Gentamycin	Ciprofloxacin	co-trimoxazole	Sum (%)
<i>E. coli</i>	S(%)	65(91.5)	55(77.4)	50(70.4)	42(59.1)	71(45.2)
	R(%)	6(8.5)	16(22.6)	21(29.6)	29(40.9)	
Kleb.sp	S(%)	12(60)	13(65)	15(75)	16(80)	20(18)
	R(%)	8(40)	7(35)	5(25)	4(20)	
<i>Ps. au.</i>	S(%)	16(88.9)	12(66.6)	-	9(50)	18(11.4)
	R(%)	2(11.1)	6(33.4)	-	9(50)	
<i>S. au.</i>	S(%)	8(80)	4(40)	7(70)	-	10(6.3)
	R(%)	2(20)	6(60)	3(30)	-	
Mix	S(%)	16(42.1)	10(26.3)	20(52.6)	19(50)	38(24.2)
	R(%)	22(57.9)	28(73.4)	18(47.4)	19(50)	

E. coli= *Escherichia coli*, Kleb. Sp= *Klebsiella* sp, *Ps. Au.* *Pseudomonas aeruginosa*, *S. au.*= *S. aureus*, S= sensitive, R= Resistance, -= not used

Pseudomonas aeruginosa co-trimoxazole was 50% and this antibiotic will be soon insufficient in treating UTI patients with contamination with this bacterium. But this strain was less resistant to imipenem and gentamycin, 11.1% and 33.4% respectively. Resistance rate of *Pseudomonas aeruginosa* co-trimoxazole was also 50% in another study [17], but there were no resistance to imipenem and gentamycin in that study. This shows an upcoming high resistance rates regarding to imipenem and gentamycin and can be accounted as a warning.

The resistance rate of *S. aureus* to imipenem, gentamycin and ciprofloxacin is 20%, 60% and 30% in our study. Results of Sharma *et al.* [17] study was 0%, 66.7% and 33.3% respectively. Resistance of this bacterium to Imipenem our study was high compared with this study and needs attention.

Mixed species had high resistance rate to all tested antibiotics and make treating patients with mixed culture more challenging.

CONCLUSION

Overall bacterial resistance rate to imipenem, gentamycin, ciprofloxacin and co-trimoxazole was high especially in mixed species cultures. Resistance of co-trimoxazole is needs more attention because it is more than other studies and shows unwise use of this antibiotic. Authors suggest other studies in other parts of the world to find out susceptibility pattern of agents that cause UTI in every region to help providing a policy for reducing antibiotic resistance.

REFERENCES

1. Tariq, A.L. and A.L. Reyaz, 2012. Therapeutic Analysis of Terminalia Chebula Against Uropathogenic Escherichia Coli (UPEC). Global Journal of Pharmacology, 6: 160-165.
2. Khamees, S.S., 2012. Urinary Tract Infection: Causative Agents, the Relation Between Bacteriuria and Pyuria. World Applied Sciences Journal, 20: 683-686.
3. Bahalo, S., E. Tajbakhsh, S. Tajbakhsh, M. Momeni and F. Tajbakhsh., 2013. Detection of Some Virulence Factors of Escherichia coli Isolated from Urinary Tract Infection Isolated of Children in Shahrekord Iran by Multiplex PCR. Middle-East Journal of Scientific Research, 14: 29-32.
4. Sherifa, M.S. and M.A. Moataz, 2012. Epidemiological and Microbiological Profile of Nosocomial Infection in Taif Hospitals, KSA (2010-2011). World Journal of Medical Sciences, 7: 01-09.
5. Badiheh Aghdam, V., Y. Anzabi, M. Hassanzadeh, M. Anvarian and S.B. Mansouri Zangir, 2013. Study of Causative Bacterial Agents of Urinary Tract Infections and Determining Their Antibiotic Susceptibility Pattern in Clients of Tabriz's Clinics. Middle-East Journal of Scientific Research, 13: 183-186.
6. Moinezhadeh, F., Zarabi and A. Banazadehi, 2013. Prevalence and Antimicrobial Susceptibility Patterns of Uropathogens among Patients Referring to Valiasr Laboratory in Najafabad, Isfahan, Iran. Middle-East Journal of Scientific Research, 13: 85-90.
7. Gupta, K., 2001. Increasing antimicrobial resistance and the management of uncomplicated community-acquired urinary tract infections. Int J Antimicro Agents, 135: 41-50.
8. Sharif, M.R., J. Alizargar and A. Sharif, 2013. Antimicrobial Resistance among Gram-Negative Bacteria Isolated from Different Samples of Patients Admitted to a University Hospital in Kashan, Iran. Advances in Biological Research, 7: 199-202.
9. Sharif, M.R., J. Alizargar and A. Sharif, 2013. Risk Factors of Methicillin-Resistant Staphylococcus aureus Colonization in Diabetic Outpatients, A Prospective Cohort Study. International Journal of Microbiological Research, 4: 147-151.
10. Thulasi, G. and V. Amsaveni, 2012. Antibacterial Activity of Cassia auriculata Against ESBL Producing E. coli from UTI Patients. International Journal of Microbiological Research, 3: 24-29.
11. Adedeji, B.A.M. and O.A. Abdulkadir, 2009. Etiology and Antimicrobial Resistance Pattern of Bacterial Agents of Urinary Tract Infections in Students of Tertiary Institutions in Yola Metropolis. Advances in Biological Research, 3: 67-70.
12. Clinical and Laboratory Standards Institute, 2008. Performance standards for antimicrobial susceptibility testing. Eighteenth informational supplement Document M100e S18. Wayne [PA]: Clinical and Laboratory Standards Institute.
13. Al-Sweih, N., W. Jamal and V.O. Rotimi, 2005. Spectrum and antibiotic resistance of uropathogens isolated from hospital and community patients with urinary tract infections in two large hospitals in Kuwait. Med Princ Pract, 14: 401-407.

14. Kolawale, A.S., O.M. Kolawale, Y.T. Kandaki-Olukemi, S.K. Babatunde, K.A. Durowade and C.F. Kplawale, 2009. Prevalence of urinary tract infections among patients attending Dalhatu Araf Specialist Hospital, Lafia, Nasarawa State, Nigeria. *Int J Med Medical Sci*, 1: 163-167.
15. Jha, N. and S.K. Bapat, 2005. A study of sensitivity and resistance of pathogenic micro-organisms causing UTI in Kathmandu valley. *Kathmandu University Medical Journal*, 3: 123-129.
16. Ahmed, B., W. Mursheda Akhter, M. Hasan and Md. Khorshed Alam, 2011. Sensitivity Pattern of Urinary Tract Pathogens to Anti-microbial Drugs at a Tertiary Level Hospital in Bangladesh. *J. Dhaka National Med. Coll. Hos.*, 17: 18-21.
17. Harna, I. and D. paul, 2012. Prevalence of community acquired urinary tract infections in silchar medical college, Assam, India and its antimicrobial susceptibility profile. *Indian J Med Sci*, 66: 273-279.