

Original Research Article

Antimicrobial Susceptibility Pattern of Pathogenic Bacteria Causing Urinary Tract Infection (UTI) with Special Reference to Gram Negative Bacteria

Sheetal Sharma¹, Preeti Srivastava²

¹Ph.D Scholar of Microbiology, ²Associate Professor of Microbiology,
Department of Microbiology, NIMS Medical College, Jaipur, Rajasthan, India.

Corresponding Author: Sheetal Sharma

Received: 13/10/2015

Revised: 30/10/2015

Accepted: 02/11/2015

ABSTRACT

Urinary tract infections (UTI) are the most common infection encountered in clinical practice. The antimicrobial resistance in urinary pathogens is very high. So we aimed evaluating the pathogens causing urinary tract infection (UTI) and their antimicrobial sensitivity pattern of gram negative bacteria.

Material and Methods: 123 urine specimens were collected from symptomatic patients were processed for isolation of pathogens and antimicrobial susceptibility by Kirby Bauer disc diffusion method as per CLSI guidelines.

Result: Of 123 specimens, 58 specimens didn't grow any pathogens. Of the 73 which grew 61 were gram negative bacteria and 12 were gram positive bacteria. Escherichia coli were predominant pathogen (57.5%). High drug resistance was noted to ampicillin (83.6%), co-trimoxazole (68.5%), aztreonam (55%). Nitrofurantoin shows least resistance (21.3%).

Conclusion: Escherichia coli were predominated pathogen causing urinary tract infection followed by Klebsiella species. Our study shows Nitrofurantoin still good for the treatment of urinary tract infection.

Keywords: Urinary tract infection, nitrofurantoin.

INTRODUCTION

Urinary tract infections (UTIs) is one of the most common types of bacterial infection in human occurring both in the community and the health care settings. Urinary tract infections (UTI) are one of the major causes of illness affecting all age groups. It is more common in females than males. A larger majority of the urinary tract infection are caused by Enterobacteriaceae. Urinary tract infections are the most frequent infections which cause pain, fever, discomfort and extra intestinal infection. Every year approx. 150 million peoples are suffering

with UTI all over the world. Mostly infection caused by retrograde ascent of bacteria from the faecal flora by the urethra to the bladder and kidney especially in the female who have a shorter and wide urethra and is more readily by microorganisms. The structure of the female urethra and vagina makes it susceptible to trauma during sexual intercourse as well as bacteria been massaged up the urethra and into the bladder during pregnancy and or child birth. There are urinary pathogen virulence factor that promote adherence to mucosal surfaces and subsequent infections. Host

factor such as epithelial cell receptivity are also important in infection process. Although Fungi and Viruses are occasional etiological agents, urinary tract infection is predominantly caused by bacteria. [1] Most common causative agent is Escherichia coli and more prone to play a role in causing 80%-90% lower UTI, whereas in about 95% of patient suffering from pyelonephritis, normally the infecting organism are gram negative isolates, proteus mirabilis, klebsiella pneumonia [2] and some gram positive organism found are Coagulase negative staphylococci, streptococcus agalacticus. [3] UTI are usually treated with antibiotics and microbiological testing is not always necessary, because in most cases, urine culture and susceptibility testing cost is more than the antibiotic treatment itself. Although there are large group of antimicrobial agents are available for the treatment of UTIs, none of them can treat all UTIs. [4] Our study aimed to gaining knowledge about the type of pathogens which responsible for UTIs and their susceptibility patterns may help the clinicians to choose the right empirical treatment.

MATERIALS AND METHODS

Sample collection and Transportation:

A total 123 early morning midstream urine specimens were collected in sterile plastic container from the patients with all aseptic precautions. All samples were properly labeled indicating the source, date/time of collection, age and sex of the patients. All

specimens was inoculated on Blood agar and MacConkey agar plates and incubated at 37⁰ C for 24-48 hrs. Significant growth was identified and antibiotic susceptibility testing (AST) was done according to standard procedure. AST was done by Kirby Bauer disc diffusion testing [5] and result interpreted according to Clinical laboratory standard institute (CLSI) guidelines. [6] Antibiogram of gram negative bacilli were shown in table and resistance profile for various antibiotics was compared.

RESULTS

A total 123 urine specimens were collected from patient suspected of having UTI, out of which a total number of 73(59.34%) showed significant bacterial growth (>10⁵ cfu/ml) and were included in the study. In our study we found 61 (83.55%) Gram negative bacteria and 12 (16.43%) Gram positive bacteria from 73 (59.34%) culture positive urine samples.

Table No. 1: Distribution of organism isolate from cases of UTI

Total Positive Samples: 73

Organism	No. of organism isolated	Percentage %
E.coli	42	57.5%
Klebsiella spp.	8	10.9%
CONS	10	13.6%
Staph. aureus	2	2.7%
Klebsiella penumoniae	5	6.8%
Pseudomonas spp.	3	4.1%
Proteus mirabilis	3	4.1%
Total	73	100%

Table No. 2: Prevalence of UTIs in relation to sex wise

Sex	Examined	Positive	Percentage %
Male	69	29	39.71%
Female	54	44	60.26%
Total	123	73	59.33%

Table No. 3: Antibiotic Susceptibility of Gram negative pathogens

Total Positive Samples: 61 (Gram Negative Bacteria)

Antibiotics	Sensitive	Moderate sensitive	Resistant	Percentage resistant
Ampicillin	9	0	51	83.6%
Amikacin	31	1	19	31.1%
Gentamicin	29	0	32	52.4%
Aztreonam	27	0	34	55.6%
Imipenem	46	0	15	24.5%
Ciprofloxacin	33	2	26	42.6%
Ceftazidime	29	0	32	52.4%
Cefepime	32	0	19	31.1%
Cefuroxime	30	0	31	50.8%
Co-trimoxazole	19	0	42	68.5%
Nitrofurantoin	48	0	13	21.3%

Out of total 123 urine specimens 69 males and 54 females were examined in the study. Female were the most common gender 41 (56.16%) compared to males 26 (35.61%). *E. coli* were the most common agent (57.5%) grown followed by *Klebsiella* spp. and CONS. *Candida* and enterococci were not isolated in the study. Antimicrobial pattern of the Gram negative bacilli and gram positive cocci are shown in table no. 1.

DISCUSSION

This paper describes a study undertaken to evaluate the prevalence and susceptibility pattern of bacterial strains isolated from patient diagnosed with UTIs. It provides valuable laboratory data concerning urinary tract pathogens. UTI are the most common infection encountered in clinical practice. Many of the infection are caused by Enterobacteriaceae. Urinary tract infection is common infection in community and hospitalized patients. This may be probably due to the increase in the immunocompromised status, prolonged hospitalization, increased instrumentation, insufficient personal and environmental sanitation.^[7] The indiscriminate, inadequate and irritational use of antimicrobials has additionally contributed to appearance of resistant strains, which may turn out to be a chief cause for the morbidity and mortality in developing countries. Empiric antibiotics therapy is the mainstay of treatment for UTIs. Hence, it is imperative to perform antibiotic susceptibility testing in order to choose an effective antibiotics.

In our study the (57.5%) infection caused by *E. coli*, followed by *Klebsiella* spp. (17%) and CONS (13%) respectively. Enterobacteriaceae is accounted for a total of (83.55%) of infection. These finding are the similar to studies done by Alka N, Priti S, Shanta SN.^[8] Sexual activity has been reported to influence high occurrence of UTIs in females. Considering the fact that

most of the affecting organisms are commensals of perianal and vaginal regions, emphasis and personal hygiene especially in female may be important in reducing the UTI. In our study culture positivity is higher in females (60.26%) than males (39.71%) shown in table no. 2. In the year 2012 Rupender Kumar et. al.^[9] also reported *E. coli* (71.7%) as most common pathogen in UTI. In another study of Fox man et. al *E. coli* was the predominant pathogen in UTI.^[10] In the present study resistance to ampicillin was noted (83.6%), clotrimazole (68.5%), and nitrofurantoin (15%) respectively. Sham df et. al reported similar findings (97.8%, 92.8%, 7.7%) respectively.^[11] Many previous studies have reported similar findings in their study, Gales AC, Jones RN et al.,^[12] Wattal C et al.^[13] Further Karlowsky J A et. al detect lowest resistance to nitrofurantoin among *E. coli* (0.4%) stating that nitrofurantoin has retained that its potent activity against *E. coli* despite 50 years of use.^[14] Imipenim also shows lower resistant (24.5%). Among the antibiotic tested nitrofurantoin and imipenem show low resistance than other antibiotics, hence proving as suitable alternatives.

CONCLUSION

Escherichia coli were the predominant pathogen which cause urinary tract infection followed by *klebsiella* spp. Antibiotic resistant was very high in the study, healthcare institutes needs to be guided by a good antibiotic policy. Nitrofurantoin shows very good result for the treatment of urinary tract infections. Antimicrobial susceptibility testing is must for the treatment of UTIs. Increase in drug resistance in uropathogens is a cause a global threat. The wide availability and the common usage of penicillin and cotrimoxazole led to the development of resistant strains. If the situation is continuous, very few options will be left for the treatment and warrants immediate

actions to curb the menace of antibiotic resistant.

REFERENCES

1. El-Mahmood MA, Antimicrobial susceptibility pattern of pathogenic bacteria causing urinary tract infections at the Specialist Hospital, Yola, Adamawa state, Nigeria, *Journal of clinical medicine and research*. October 2009; Vol. 1(1): 001-008.
2. Delzell J.E. and Lefevre M.L., Urinary tract infection during pregnancy, *Amfam physician*. (2000); 61(12): 713-721.
3. Conolly A., Throp J.M., Urinary tract infection in pregnancy, *Urol Clin NorthAm*. (1996); 26(4): 779-787.
4. Patil S, Mahale K, Shetty P, et. al, Antibiotic susceptibility pattern of urinary isolates from a tertiary care hospital with special reference to Gram negative bacteria, *IOSR Journal of dental and medical sciences*. (Nov.-Dec. 2013) ;Volume 12, Issue 1 : 49-51.
5. Bauer A.W., Kirby W.M., Sherris J.C. and Turck M., Antibiotic susceptibility testing by a standardized single disk method, *Am. J. Pathol*. (1966) ;45(4) :493-496
6. Clinical Laboratories Standards Institute (CLSI), Performance of standards for antimicrobial disk susceptibility tests; approved standards, 10th ed. M02- A10, 29, Wayne, PA: CLSI; (2009).
7. Davoodian P., Nematee M. and Sheikvatan M., The inappropriate use of urinary catheters and its common complications in different hospital wards, *Saudi Journal of Kidney Diseases and Transplantation*. (2012); 23(1):63.
8. Alka N, Priti S, Shanta SN. Bacterial pathogens in urinary tract infection and antibiotic susceptibility pattern. *J Pharm Biomed Sci*. 2012 ; 21(12).
9. Rupinder Kaur, Geeta Walia and Manika Mehta, Prevalence of Urinary tract infections in children and their sensitivity to various antibiotics, *J. Acad. Indus. Res*. (2012);1(4) : 161-163.
10. Fox man B, Barlow R, D'Arcy H, Gillespie B and Sobel JD., Self reported incidence of urinary tract infection and associated costs, *Ann. Epidemiol*. (2000) ;10(8): 509-15.
11. Sahn F D, Thornsberrry C et al. Multidrug-Resistant Urinary Tract Isolates of Escherichia coli: Prevalence and Patient Demographics in the United States in 2000. *Antimicrob agents and Chemother*.2001; 45(5): 1402-06.
12. Gales AC, Jones RN et al. Activity and spectrum of 22 antimicrobial agents tested against urinary tract infection pathogens i n hospitalized patients in Latin America; report from second year of the SENTRY Antimicrobial surveillance program (1998). *J Antimicrob Chemother*. 2000;45: 295-303.
13. Wattal C et al. ESBL- An emerging threat to antimicrobial therapy. *Microbiology Newsletter* 2005. Sir Ganga Ram Hospital. 2006;10(1):1-8.
14. Karlowsky JA, Kelly LJ et al. Trends in Antimicrobial Resistance among Urinary Tract Infection isolates of Escherichia coli from Female Outpatients in the United States. *Antimicrob agents and Chemother*.2002; 46(8): 2540-45.

How to cite this article: Sharma S, Srivastava P. Antimicrobial Susceptibility Pattern of Pathogenic Bacteria causing Urinary tract infection (UTI) with special reference to Gram negative bacteria. *Int J Health Sci Res*. 2015; 5(11):136-139.
