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Research Article

UROPATHOGENS: ISOLATION AND ANTIBACTERIAL SUSCEPTIBILITY PATTERN

HARIT KUMAR, NITIN GOEL INSAN, SHUBHAM CHAUHAN, VARSHA A SINGH

Department of Microbiology, MM Institute of Medical Sciences & Research Maharishi Markandeshwar University, Mullana, Ambala, Haryana, India. Email: kumarharit4@gmail.com

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ABSTRACT

Objective: To find the antibiotic sensitivity pattern of uropathogens.

Methods: A total of 100 urine samples of clinically suspected urinary tract infection were collected from May 2016 to July 2016. The samples were inoculated on cystine lactose electrolyte deficient agar and incubated at 37°C for 24 hrs.

Results: A total of 77 (77%) samples were positive showing microbial growth. Among all isolates, *Escherichia coli* was 36.36%, followed by *Klebsiella* spp. (35.06%), *Citrobacter* spp. (6.49%), *Staphylococcus aureus* (6.49%), *Pseudomonas* spp. (5.19%), *Enterococcus faecalis* (3.90%), and *Acinetobacter* spp. (1.30%). For Gram-positive isolates, the most effective antibiotic was nitrofurantoin followed by sulphafurazole. For Gram-negative isolates, the most effective antibiotic was nitrofurantoin followed by gentamicin and piperacillin/tazobactam.

Conclusion: In this study**,** nitrofurantoin was the most effective antibiotic for Gram-positive and Gram-negative uropathogens.

Keywords: Urinary tract infection, *Escherichia coli, Klebsiella* spp., Nitrofurantoin.

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INTRODUCTION

Urinary tract infection (UTI) is one of the most common types of bacterial infection in humans [1]. The infections may be symptomatic or asymptomatic, and either type of infection can result in serious sequel if left untreated [2]. Urine is a favorable medium for growth of bacteria due to its enriched chemical composition [3]. UTI is the bacterial infection which is generally associated with minimal morbidity except among specific subpopulations [4].

The clinical manifestations of UTI depend on the part of the urinary tract involved, the etiologic organisms, the severity of the infection, and the patient's ability to mount an immune response to it [5]. UTI is classified into two types, uncomplicated and complicated infections. Uncomplicated UTI occurs due to bacterial infection, most often by *Escherichia coli*. Women are frequently affected by uncomplicated UTI than men. Complicated infections, which occur in men and women of any age, are also caused by bacteria, but they tend to be more severe and more difficult to treat [6]. Signs and symptoms may include fever, chills, dysuria, urinary urgency, frequency, and cloudy or malodorous urine. The symptoms of a person with UTIs depend on the age and the location. Chronic and acute infection of urinary tract leads to high blood pressure, kidney damage, and results in death. Gram-negative bacteria (80-85%) are the primary organisms that cause UTI. Gram-positive bacteria also account for 15-20% cases of UTI [7,8].

The occurrence of antibiotic resistance in the management of UTIs is a severe public health issue, mostly in the developing world where apart from increased level of poverty, ignorance, and poor hygienic practices, there is also the high occurrence of fake and spurious drugs of questionable quality in circulation. Understanding of etiological agents of UTIs and their sensitivities to available drugs is of immense value to the rational selection and use of antimicrobial agents and to the development of appropriate suggesting policies. Antibiotic choice should be based on local circulating bacterial strains and resistance profiles, which vary between countries [9].

The purpose of this study was to summarize the laboratory diagnosis of routine UTI and the antimicrobial susceptibility pattern of isolates in the Department of Microbiology, MM Institute of Medical Science and Research, Mullana, Ambala, Haryana, India.

METHODS

A total of 100 samples were processed as per standard operating procedures from May 2016 to July 2016. Each sample was examined for the presence of pus cells, red blood cells, epithelial cells, casts, and crystals.

Isolation and identification of organisms

A standard loop technique was used to place 0.01 ml of urine for inoculation on cystine lactose electrolyte deficient agar, and these plates were incubated at 37°C for 24 hrs. The number of colonies was

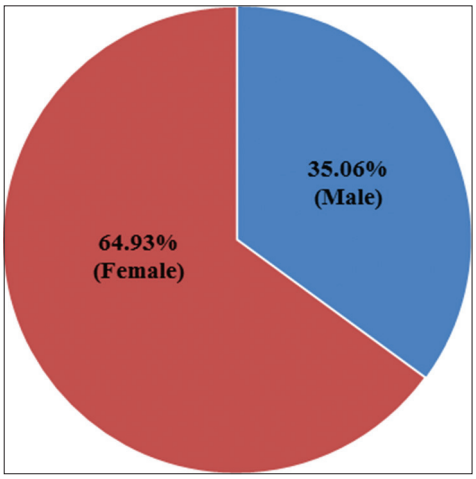

Chart 1: Sex-wise distribution of positive samples (N=77)

Table 1: Total number of positive and sterile samples

Total number of samples	Total number of positive samples (%)	Number of sterile samples (%)
100	77 (77)	23 (23)

Table 2: Distribution of isolates causing UTI

Isolates	Number of isolates N=77 (%)
Gram-positive bacteria	
Staphylococcus aureus	5 (6.49)
Enterococcus faecalis	3 (3.90)
Gram-negative bacteria	
Escherichia coli	28 (36.36)
Klebsiella spp.	27 (35.06)
Citrobacter spp.	5 (6.49)
Pseudomonas spp.	4 (5.19)
Acinetobacter spp.	1 (1.30)
Fungus	
Candida albicans	4 (5.19)
Total	77 (100)

UTI: Urinary tract infection

Table 3: Efficiency of each antibiotic among all isolates

Antibiotic	Isolates sensitive (N=73)	Total percentage
Nitrofurantoin	55	75.34
Gentamicin	28	38.36
Piperacillin+tazobactam	29	39.73
Norfloxacin	25	34.25
Sulphafurazole	15	20.55
Co-trimoxazole	11	15.07

counted to quantify the organism. The diagnosis of UTI was made based on the significant colony count of $>10^5$ CFU/ml for the isolates as per "Kass phenomena." Isolates were identified by different biochemical tests as per standard operating procedures.

Antimicrobial susceptibility testing

Antibiotic susceptibility testing was performed by Kirby–Bauer method as recommended by the Clinical and Laboratory Standard Institute (2015). Following antibiotics were used: Gentamicin (10 mcg), co-trimoxazole (25 mcg), norfloxacin (10 mcg), sulphafurazole (300 mcg), piperacillin+tazobactam (100/10 mcg), and nitrofurantoin (300 mcg).

RESULTS

A total 100 urine samples were processed in this study, out of which 77 samples were culture positive (Table 1). Out of 77 positive samples, 50 (64.93%) were from female patients and 27 (35.06%) were from male patients (Chart 1). Most commonly isolated organism was *E. coli* (36.36%) followed by *Klebsiella* spp. (35.06%) (Table 2). Antibiotic sensitivity testing was done for 73 bacterial isolates only. Nitrofurantoin was the most effective antibiotic for gram positive as well as gram negative isolates (Charts 2 and 3; Table 3).

DISCUSSION

This study included a total of 100 samples of urine collected from May 2016 to July 2016 from patients suspected of UTI. Overall positivity of total samples was 77% (Table 1 and Chart 1) which was higher than prevalence rate of 66.78% as recorded by Mahesh *et al.* [10]. Females (64.94%) were more prone to UTI than males (35.06%) which is supported by a study of Maji *et al.*, [4] who showed a higher prevalence of UTI in female (54.68%) in comparison to male (45.31%).

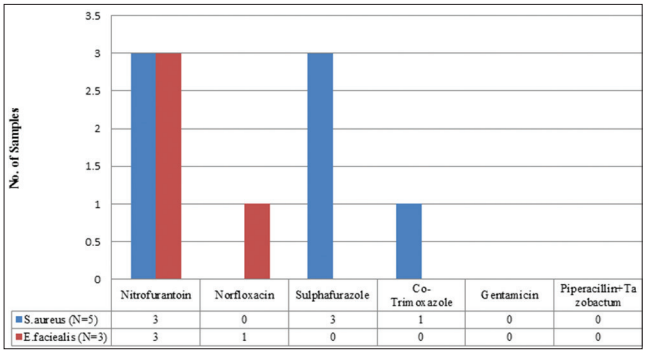

Chart 2: Antibiotic sensitivity pattern of Gram-positive bacteria (N=8)

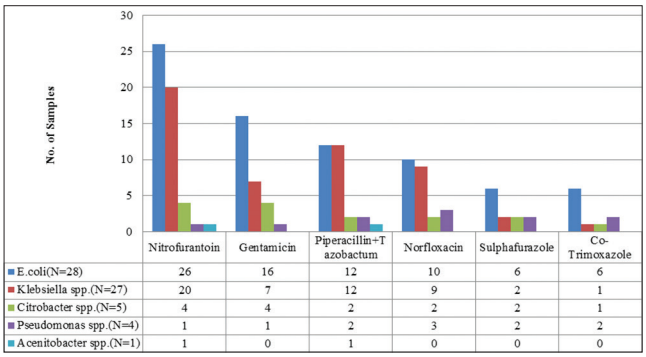

Chart 3: Antibiotic sensitivity pattern of Gram-negative bacteria (N=65)

Among all isolates, the most prevalent isolate was *E. coli* (36.36%), followed by *Klebsiella* spp. (35.06%) (Table 2 and Chart 2) which is supported by Basavaraj and Jyothi [11], who showed *E. coli* (45%) as the most prevalent uropathogen. Antimicrobial sensitivity testing in isolates showed the highest sensitivity with nitrofurantoin (75.36%) (Table 3 and Chart 3) which was higher as studied by Kothari and Sagar [12] showing 65.7%.

REFERENCES

1. Hryniewicz K, Szczypa K, Sulikowska A, Jankowski K, Betlejewska K, Hryniewicz W. Antibiotic susceptibility of bacterial strains isolated from urinary tract infections in Poland. J Antimicrob Chemother 2001;47(6):773-80.
2. Pezzlo M. Detection of urinary tract infections by rapid methods. Clin Microbiol Rev 1988;1(3):268-80.
3. Acharya VN. Urinary tract infection – A dangerous and unrecognised forerunner of systemic sepsis. J Postgrad Med 1992;38(2):52-4.
4. Maji SK, Mandal PK, Panja C, Dolai TC, Samanta A, Kundu PK, *et al*. Prevalence and antibacterial susceptibility pattern of aerobic bacteria causing urinary tract infection in tribal population in rural part of West Bengal, India. Int J Curr Microbiol App Sci 2016;5(6):406-12.
5. Foxman B. Epidemiology of urinary tract infections: Incidence, morbidity, and economic costs. Dis Mon 2003;49(2):53-70.
6. Muraleetharan M, Viswanathan T. Epidemiological studies on varying extended-spectrum β-lactamases producing uropathogenic bacteria. Int J Pharm Pharm Sci 2014;6(11):57-60.
7. Mollick S, Dasgupta T, Hasnain MJ, Ahmed M. Isolation and characterization of pathogens responsible for urinary tract infection in Bangladesh and determination of their antibiotic susceptibility pattern. J App Pharm Sci 2016;6(04):72-6.
8. Chaudhary BL, Insan NG, Payal N, Vashistha R, Rajput A. ESBL and AmpC detection in *Klebsiella* species by non molecular methods. Int J Curr Microbiol App Sci 2014;3(4):323-9.
9. El Astal Z. Increasing ciprofloxacin resistance among prevalent urinary tract bacterial isolates in Gaza Strip, Palestine. J Biomed Biotechnol 2005;2005(3):238-41.
10. Mahesh E, Ramesh D, Indumathi VA, Punith K, Raj K, Anupama HA.

Complicated urinary tract infection in a tertiary care center in south India. Al Ameen J Med Sci 2010;3(2):120-7.

11. Basavaraj MB, Jyothi P. Antibiotic sensitivity pattern of *Citrobacter* spp. Isolated from patients with urinary tract infections in tertiary care hospital in south India. Int J Pharm Pharm Sci 2015;7(1):252-4.
12. Kothari A, Sagar V. Antibiotic resistance in pathogens causing community acquired urinary tract infections in India: A multicentric study. J Infect Dev Ctries 2008;2:354-8.