Original Research Article

Prevalence and antibiotic sensitivity of pathogens isolated in urinary tract infection in a medical college hospital

Rajesh Prasad[1], Kumari Renu[2], Amit Kumar Anand[3*], Arvind Kumar[4]

[1]Tutor, [3]Assistant Professor, [4]Associate Professor and Head, Department of Microbiology, VIMS, Pawapuri, Bihar, INDIA.
[2]PG Resident, MGM Medical College, Kishanganj, Bihar, INDIA.
Email: dramitkranand@yahoo.co.in

Abstract

UTI is a common cause of morbidity worldwide. It is mostly caused by E coli or other gram negative bacteria. Many of the organisms have become resistant to common antibiotics, The present cross sectional study was conducted to find prevalence of various pathogens in urine of patients suffering from urinary tract infection and to assess the antibiotic sensitivity profile of these isolates. Urine was collected and culture and sensitivity was done. Females were affected more than males. E. coli was the most common organism isolated. Most of the organisms were sensitive to Amikacin and ciprofloxacin.

Key Word: Antibiotic sensitivity, Pathogens, Prevalence, Urinary Tract Infection (UTI)

***Address for Correspondence:**
Dr. Amit Kumar Anand, Assistant Professor, Department of Microbiology, VIMS, Pawapuri, Bihar, INDIA
Email: dramitkranand@yahoo.co.in

Received Date: 21/11/2018 Revised Date: 24/12/2018 Accepted Date: 10/01/2019
DOI: https://doi.org/10.26611/1008912

Access this article online

Quick Response Code:

Website: www.medpulse.in

Accessed Date: 15 January 2019

INTRODUCTION

Urinary tract infection is one of the commonly encountered infections nowadays.[1] As per recent estimates, about seven million OPD visits per year worldwide are due to this condition.[2] It has been found that most of these infections are caused by E coli. Gram Negative bacteria predominate over the Gram Positive ones. UTI is seen more commonly in females because of Anatomical predisposition.[3] The treatment needs administration of antibiotics which is often selected mainly on the local experience and antibiotic resistance pattern. Concurrent to development of new antibiotics, the rates of resistance to antimicrobial agents have also increased and this is the major problem in treatment of this condition.[4] Most of the times, antibiotic treatment is started before results of culture are received. Systematic study has not been done in this area to assess the pattern of antimicrobial resistance and hence this study was done.

AIMS AND OBJECTIVES

The present study was conducted to find prevalence of various pathogens in urine of patients suffering from urinary tract infection and to assess the antibiotic sensitivity profile of these isolates.

MATERIAL AND METHODS

The present study was descriptive cross-sectional in nature conducted in the department of microbiology of a medical college hospital. The study population included patients' above 18 years of age reporting to the OPD of Medical College Hospital during the study period and suffering from UTI. Patients admitted in the hospital one week before reporting to OPD and those who have taken antibiotics before urine examination were excluded from the study. A total of 339 urine samples were collected. Patients were explained about the study and verbal consent was taken. They were briefed about aseptic technique of urine collection and clean catch midstream urine was collected for bacteriological analysis. Dry, wide-mouthed, 20mL calibrated, screw-capped pre-sterile and leak proof universal plastic containers were used for sample collection. The specimen were labelled and transported to the laboratory immediately, so that it could be analyzed within 6 hours. 0.2 mg boric acid was added in each container to prevent bacterial growth. For isolation of

How to cite this article: Rajesh Prasad, Kumari Renu, Amit Kumar Anand, Arvind Kumar. Prevalence and antibiotic sensitivity of pathogens isolated in urinary tract infection in a medical college hospital. *MedPulse International Journal of Microbiology.* January 2019;9(1): 05-08. https://www.medpulse.in/Microbiology/

bacteria, calibrated loop method was used. Sterile 4.0mm platinum wired calibrated loop delivering 0.001 ml of urine was used. Loopful sample of urine was placed on blood agar, Mac Conkey agar and Cystine Lactose Electrolyte Deficient (CLED) agar plates. The inoculated plates were incubated at 37^{O}C for 24 hours. If no growth was visible, it was further incubated for 24 hours. Bacterial load per ml of urine was calculated by multiplying the number of colony counts with 1000. For declaring urine culture to be positive, a cut off point of bacterial concentration $\geq 10^5$ CFU/ ml was used. During microscopic examination of urine, if the number of pus cells per high power field were > 5, a cut off point of bacterial concentration $\geq 10^4$ CFU/ ml was used. To differentiate the Gram positive and Gram negative organisms, Gram staining was done. Bacterial isolates were further identified by cultural characteristics and biochemical tests including Catalase, Oxidase, Coagulase, Motility test, Urease, Indol, H2S Production, Citrate utilization, Sugar fermentation and other tests as applicable. The recommendations of the Antibiotic Committee of French Society of Microbiology (CA-SFM) were followed for antibiotic sensitivity test by Kirby Bauer disc diffusion method. The surface of Mueller Hinton agar plates were streaked using the sterile cotton swab. It was allowed to dry. Filter paper disks containing designated amount of antibiotics was gently and firmly applied over the agar plates. It was left at room temperature for one hour to allow diffusion of antibiotics into the agar plate. The plates were incubated at 37^{O}C for 24 hours. Presence on inhibition zone in the agar plates indicated antimicrobial activity. The interpretation of antibiotic sensitivity testing was as per CLSI – 2011 guidelines. Data was entered and analyzed using SPSS v 16.0. Prevalence was described as frequency and percentage. Appropriate tests were done to calculate statistical significance.

RESULTS

Table 1: showing prevalence of urinary tract infection according to demographic characteristics (n=339)

Demographic characteristics	Total number of samples	Total number of positive samples
Age		
- <20 years	41(12.1%)	21 (11.1%)
-20-40 years	142(41.9%)	93 (48.9%)
- 40-60 years	98(28.9%)	46 (24.2%)
-> 60 years	58(17.1%)	30 (15.8%)
Sex		
-Male	108(31.9%)	53 (27.9%)
-Female	231(68.1%)	137 (72.1%)

Table 2: showing frequency of isolation of various pathogens (n=190)

Organism	Frequency	%	95% CI
Staphylococcus aureus	11	5.8%	2.5-9.1 %
Streptoccocus	6	3.2%	0.7-5.7 %
E. coli	91	47.9%	40.8-55 %
Enterobacter	15	7.9%	4.1-11.7 %
Klebsiella	30	15.8%	10.6-21 %
Citrobacter	17	8.9%	4.9-12.9 %
Proteus	8	4.2%	1.3-7.1 %
Pseudomonas	11	5.8%	2.5-9.1 %

Table 3: showing antimicrobial sensitivity pattern

Antibiotic	Staphylococcus	E. Coli	Klebsiella	Pseudomonas	Proteus	Citrobacter	Enterobacter
Penicillin	23.3	-	-	-	-	-	-
Ampicillin	59.8	62.2	22.1	20.9	9.3	36.2	29.7
Ciprofloxacin	63.2	83.9	81.2	39.2	39.2	61.4	75.6
Norfloxacin	44.7	55.7	65.5	16.8	27.5	43.2	48.7
Amikacin	81.2	91.3	93.4	43.2	56.1	59.9	81.3
Gentamicin	67.4	83.4	81.7	45.9	77.3	42.6	77.7
Co-trimaxazole	34.6	12.8	15.6	11.3	21.3	22.3	38.6
Tetracycline	49.2	-	-	-	-	-	-
Nitrofurantoin	43.5	62.3	44.4	32.6	34.6	76.4	23.5
Cefazolin	72.8	47.4	87.3	33.6	51.1	61.3	66.2
Chloramphanicol	74.1	-	-	-	-	-	-
Erythromycin	29	-	-	-	-	-	-

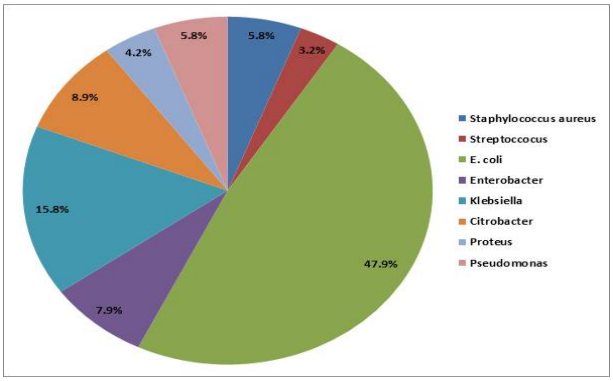

Figure 1: showing various pathogens isolated

DISCUSSION

A total of 339 urine samples were included in the present study. 190 samples were found to be positive (56.1%). Table-1 shows the prevalence of urinary tract infection according to demographic characteristics. It is seen that the most common age group affected is 20-40 years and this group is also having most of the culture positive samples. Females are affected more than the males and are also having higher rate of culture positivity. Table-2 shows the pathogens cultured from the collected urine samples. Most common organism isolated was E. coli (47.9%) followed by Klebsiella (15.8%), Citrobacter (8.9%), Enterobacter (7.9%) etc. Staphylococcus aureus was the most commonly isolated gram positive bacteria (5.8%). Table-3 shows the antimicrobial sensitivity pattern of the isolated organism. It was seen that resistant to penicillin, tetracycline and erythromycin was high. Bacteria were sensitive to amikacin, cefazolin and ciprofloxacin. Setu *et al* [5] in Bangladesh found that Escherichia coli were seen in 63.93% cases, Klebsiella pneumoniae in 17.09% and others as Pseudomonas spp. Enterobacter Acinetobacter spp. Citrobacter spp Proteus spp. Morganella. Among Gram positive organism S. Aureus, S. saprophyticus S. agalectiae and Enterococci were found. Urinary tract infections were more prevalent in women than men (61.68% vs. 38.32%). High level of sensitivity was found to imipenem, amikacin, nitrofurantoin, ceftriaxone, gentamicin, cefuroxime in most of the isolates. Kidwai *et al* [6] observed in Pakistan that most common isolated pathogen was Eschericia coli (59%) followed by staphylococcus aureus (16.4%) and Klebsiella (11%). 30% pathogens showed sensitivity to 4-6 antibiotics, 12% strains to 7-9 antibiotics, 18% were sensitive to ≤3 drugs and in 1.6% patients resistance to all antibiotics was seen. Saha *et al* [7] found in West Bengal that Escherichia coli was the most abundant uropathogen with a prevalence rate of 67.1%, followed by Klebsiella spp. (22%) and Pseudomonas spp. (6%). Penicillin was least effective against UTI-causing E. coli and maximum susceptibility was recorded for the drugs belonging to fourth generation cephalosporins. Prakash *et al* [8] observed in Uttar Pradesh that UTI was prevalent in 53.82% patients; however, the prevalence was significantly higher in females than in males. Females within the age group of 26–36 years and elderly males of ≥48 years showed higher prevalence of UTI. Gram negative bacteria (90.32%) were found in high prevalence than Gram positive (9.68%). Escherichia coli (42.58%) was the most prevalent gram negative isolate. Nitrofurantoin (78.71%) was found the most resistant drug among all uropathogens. Singh *et al*[9] found in Varanasi that high prevalence of gram negative E.coli and gram positive S. aureus were found in all slums. There was increase in resistance to some antimicrobial agents, mainly the resistance to ampicillin, cefozolin, gentamicin, ofloxacin seen in E. coli. Rajendran *et al* [10] found in Tamil Nadu that extended spectrum beta lactamase positive E. coli was the commonest organism isolated (35.5%) followed by extended spectrum beta lactamase negative E. coli and Enterococcus. Females (68.63%) were affected more than males. The most sensitive oral antibiotic to almost all organisms was Nitrofurantoin followed by Cotrimoxazole and Norfloxacin. Razak *et al* [11] observed in Karnataka that E. coli was the most frequently isolated urinary pathogen (37.95%), followed by Klebsiella (21.41%) and Acinetobacter(10.94%). E-coli was highly sensitive to Nitrofurantoin(81.92%) and Amikacin(69.88%). Klebsiella was highly sensitive to Impinem and highly resistant to Ampicillin. Kulkarni *et al* [12] found that 39.5% cases were culture-positive for E. coli. 43% were multi drug resistant. The isolates showed high level of resistance to Ampicillin (82.53%), Cefuroxime (72.41%), Amoxicillin-Clavulanic acid (71.90%), Ceftriaxone (66.58%), Ciprofloxacin (65.82%) and Cefepime (57.47%). The isolates were sensitive to Imipenem (96.71%), Nitrfurantion (92.41%), Amikacin (90.89%), Chloramphenicol (85.82%), Piperacillin-tazobactum (80.76%), Gentamicin (59.24%), Azetreonam (54.43%) and Norfloxacin (53.67%). It is apparent from

the above discussion that E. coli was the most prevalent pathogen in UTI cases. However, microbiological profile as well as antimicrobial sensitivity varied from place to place. Regular assessment of drug sensitivity is therefore essential for proper management of these cases. [13]

CONCLUSION

UTI commonly affected individuals between third to fifth decades of life. Females were more commonly affected than males. E. coli was the most common organism isolated. Amikacin and ciprofloxacin were the drugs to which most of the organisms were sensitive.

REFERENCES

1. Jubina Bency AT, Priyanka R, Jose P. A study on the bacteriological profile of urinary tract infection in adults and their antibiotic sensitivity pattern in a tertiary care hospital in central Kerala. Int J Res Med Sci. 2017;5(2):666-9.
2. Wilson ML, Gaido L. Laboratory diagnosis of urinary tract infections in adult patients. Clin Infect Dis. 2004; 38:1150–1158.
3. De Backer D, Christiaens T, Heytens S, de Sutter A, Stobberingh EE, Verschraegen G. Evolution of bacterial susceptibility pattern of Escherichia coli in uncomplicated urinary tract infections in a country with high antibiotic consumption: A comparison of two surveys with a 10 year interval. J Antimicrob Chemother 2008; 62:364–8.
4. Goldstein FW. Antibiotic susceptibility of bacterial strains isolated from patients with community acquired urinary tract infections in France. Multicentre Study Group. Eur J Clin Microbial Infect Dis 2000; 19: 112-7.
5. Setu SK, Sattar ANI, Saleh AA, Roy CK, Ahmed M, Kabir HM. Study of Bacterial pathogens in urinary tract infection and their antibiotic resistance profile in a tertiary care hospital of Bangladesh. Bangladesh J Med Microbiol. 2016; 10 (1): 22-6.
6. Kidwai SS, Nageen A, Ghaznavi S, Bashir F, Ara J. Antibiotic susceptibility in commonly isolated pathogens from urinary tract infection in a cohort of subjects from low socioeconomic strata. Pak J Med Sci. 2017;33(2):254-259
7. Saha S, Nayak S, Bhattacharyya I, Saha S, Mandal AK, Chakraborty S, Bhattacharyya R, Chakraborty R, Franco OL, Mandal SM and Basak A (2014) Understanding the patterns of antibiotic susceptibility of bacteria causing urinary tract infection in West Bengal, India. Front. Microbiol. 5:463.
8. Prakash D, Saxena RS. Distribution and antimicrobial susceptibility pattern of bacterial pathogens causing urinary tract infection in urban community of Meerut city, India. ISRN Microbiol. 2013 Oct 29; 2013:749629.
9. Singh B, Katiyar, Ragini Tilak, Ratan Kumar Srivastava and Rajveer Singh Chauhan. 2018. Prevalence of Urinary Tract Infection Causing Microorganism and Determination of Susceptibility to Antibiotic among Slum Women of District Varanasi. *Int.J.Curr.Microbiol.App.Sci.* 7(02): 3483-3497.
10. Rajendran V, Nepoleon R, Solanke PV, Zailu MS, Valli P. A study on urinary tract infection in a tertiary care hospital. Int J Adv Med 2017; 4:1401-5.
11. Razak SK, Gurushantappa V. Bacteriology of urinary tract infection and antibiotic susceptibility pattern in a tertiary care hospital in South India. Int J Med Sci Public Health 2012; 1:109-112.
12. Kulkarni SR, Peerapur BV, Sailesh KS. Isolation and Antibiotic Susceptibility Pattern of Escherichia coli from Urinary Tract Infections in a Tertiary Care Hospital of North Eastern Karnataka. J Nat Sci Biol Med. 2017 Jul-Dec; 8(2): 176–180.
13. Biswas R, Rabbani R, Ahmed HS, Abdus M, Sarkar S, Zafrin N, *et al*. Antibiotic sensitivity pattern of urinary tract infection at a tertiary care hospital. Bangladesh Crit Care J. 2014;2(1):21-4.

Source of Support: None Declared
Conflict of Interest: None Declared