wjpmr, 2017,3(11), 183-186

SJIF Impact Factor: 4.103

WORLD JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.wjpmr.com

Research Article

ISSN 2455-3301

WJPMR

BACTERIOLOGICAL PROFILE AND ANTIBIOTIC SUSCEPTIBILITY PATTERN (ANTIBIOGRAM) OF URINARY TRACT INFECTIONS IN TERTIARY CARE HOSPITAL AT RAJSAMAND

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Article Received on 18/10/2017 **Article Revised on 08/11/2017** **Article Accepted on 29/11/2017**

ABSTRACT

Background: To detect the prevalence rate of bacterial infection among urinary isolates and to determine the antimicrobial susceptibility pattern in the rural area of Rajsamand. **Aim:** of the study was to find prevalence of uropathogen in this part of world along with to study the antibiogram of UTI cases. **Material and Method:** A retrospective analysis of bacterial pathogens and their antimicrobial susceptibility was done on urine sample s at tertiary care hospital. Antimicrobial susceptibility tests were done using disc diffusion technique as per the standard of Kirby-Bauer method. **Results:** Out of total 600 samples, 193 samples were found positive. Out of which males 74(38%) and females119(62%) were positive. Females showed higher prevalence rate of UTI than males. Gram negative bacteria were found in high prevalence rate than gram positive bacteria. E. coli 101(52 %) was the most common organism, followed by Klebsiella 25(13%), CoNs22(11%), Pseudomonas13(7%), CoPs11(6%), Enterococcus12(6%) Candida Sp. 6(3%) and Proteus Sp. 3(2%). **Conclusion:** There is a need for constant monitoring of susceptibility of specific pathogens in different populations to commonly used anti-microbial agents.

KEYWORDS: Urinary tract infection, Antibiotic Susceptibility Pattern, Uropathogenes.

INTRODUCTION

Urinary tract infection (UTI) is an important health-care problem affecting millions every year in the community and tertiary care settings. It is a term applied to a variety of clinical conditions ranging from asymptomatic presence of bacteria in the urine to severe of the kidney with sepsis.[1]

A count of $>10^5$ colony forming units (CFU)/mL of urine is considered as significant bacteriuria.[2] Etiological agents of UTI are variable and usually depend on time, geographical location and age of patients.[3] Most UTIs are caused by Gram-negative bacteria like Escherichia coli (E. coli), Klebsiella spp., Proteus mirabilis, Pseudomonas aeruginosa, Acinetobacter spp., and Serratia spp. and Gram-positive bacteria such as Enterococcus spp. and Staphylococcus spp[3]. E. coli is the single most common pathogen accounting for 70-75% of all cases of UTI.[2]

The antimicrobial agents used in treatment of UTI include cell wall inhibitors like Penicillin, Cephalosporins, DNA gyrase inhibitors like Floroquinolones and Aminoglycosides that are protein synthesis inhibitors. Inappropriate and extensive use of antibiotics has lead to the development of multidrug resistance among the pathogens. To ensure appropriate treatment, knowledge of the organisms that cause UTI and their antibiotic susceptibility pattern is mandatory.

MATERIAL AND METHOD

The study was conducted in a tertiary care hospital, Rajsamand, Rajasthan. All positive urine culture and sensitivity reports of males and females over a period of one year were included in the study. Urine culture and sensitivity reports with more than one causative organism were excluded from the study Sample size. The organism isolated and the antimicrobial susceptibility profiles were collected from the registration records using a standard data collection form.

Culture and Identification

As per the standard operating procedures, clean-catch midstream morning urine specimen were collected under

sterile conditions in a sterile wide mouth container. All samples were completely processed within 1–2 h after arrival, to avoid overgrowth of any contaminating bacteria. Urine samples were plated on Nutrient agar, Blood agar and MacConkey agar using calibrated wire loops and then incubated aerobically at 37 °C for 24 h. From positive cultures, uropathogens were identified based on biochemical reaction.[4]

Antimicrobial susceptibility tests

According to the standard operational procedures, antimicrobial susceptibility tests were done on Mueller-Hinton agar (Oxoid, Hampshire, England) using Kirby-Bauer disk diffusion method[8] antimicrobial agents of variable strength. Resistance data were interpreted according to Clinical laboratory Standards Institute. Reference strains of E. coli ATCC 25922 and Staphylococcus aureus ATCC 25923 (S. aureus) were used for quality control for antimicrobial susceptibility tests.[9] Statistical Analysis: Data entry was done using Microsoft Excel and the data was analysed using SPSS 16.

RESULTS

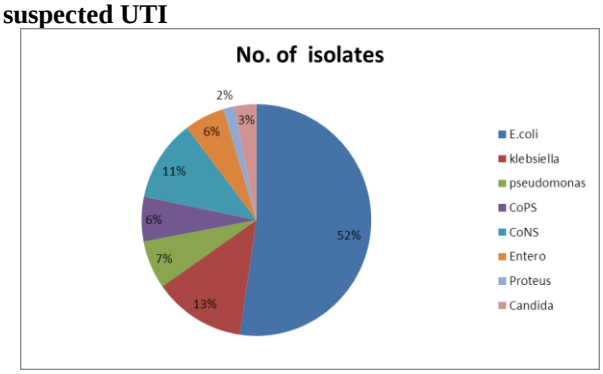
A total of 600 samples were taken during a period of 2015 -2016, out of which 193 were culture positive cases. The identification of bacteria and culture and sensitivity was carried out for the same. Out of 193 cases, males were 74 (38%) and females were 119(62%) and more common in 21-40 age group. The number of organisms isolated from females subjects were more than males (Table 1). E. coli 101(52 %) was the most common organism, followed by Klebsiella 25(13%), CoNs 22(11%), Pseudomonas 13(7%), CoPS 11(6%), Enterococcus 12(6%) Candida Sp. 6(3%) and Proteus Sp.3(2%). Sex-wise distribution of UTI by organism, Out of 74 males E. coli was isolated from 34 and Klebsiella 14 and out of 119 females E. coli was isolated from 65 and Klebsiella 11.E.coli (52%) , followed by Klebsiella (13%) were the commonest in both sexes (Table 4).The antibiotic susceptibility profile of gram negative organisms showed that E.coli and klebsiella were highly susceptible (100%) to imipenem followed by Nitrofurantoin, Amikacin, Piperacillin tazobactum, Ceftazidime/clavulanic acid while its resistance profile showed that they were more resistant to sulphamethoxazoles followed by amoxclav, ampicillin sulbactum, cephalosporins, and ceftriaxone. Staphylococcus aureus and Enterococcus were highly sensitive to Nitrofurantoin followed by Vancomycin, Linezolid, Gentamicin, Ciprofloxacin, Levofloxacin, Cotrimoxazole and Cephalosporins.

Table 1: Age and Sex distribution of patients with suspected UTI.

Age Group	Male	Female	Total
0-20	10	15	25
21-40	20	55	75
41-60	16	33	49
61-80	26	14	40
81-100	02	02	04
Total	74(38%)	119(62%)	193

Out of total 600 urine culture, 193 cases were culture Positive and sensitivity was also carried out for the same. Out of 193 cases, males were 74 (38%) and females were 119(62%) and more common in 21-40 age group. (Table.1).

Bacterial isolates from urine sample of patients with suspected UTI



E. coli 101(52 %) was the most common organism, followed by Klebsiella 25(13%), CoNs22(11%), Pseudomonas 13(7%), CoPs11(6%), Enterococcus 12(6%) Candida Sp. 6(3%) and Proteus Sp. 3(2%).

Table 2: Age- Sex distribution of patients with suspected UTI according to type of uropathogen.

Organisms	0-20		21-40		41-60		61-80		81-100		Total (n=193)
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	
E.coli	4	9	8	26	9	20	15	9	-	1	101
Klebsiella	3	2	3	4	4	4	4	1	-	-	25
Pseudomonas	1	-	2	4	-	3	1	1	1	-	13
Proteus sp.	-	-	-	-	-	-	1	2	-	-	3
Cons	-	4	2	9	2	2	2	1	-	-	22
Cops	-	-	-	9	-	1	2	-	-	-	12
Enterococcus	2	-	4	3	-	1	-	-	1	-	11
Candida	-	-	1	-	1	2	1	-	-	1	6

According to Age-Sex distribution of Patients, Out of 74 males E. coli was isolated from 34 and Klebsiella 14 and out of 119 females E. coli was isolated from 65 and Klebsiella 11.(Table 2).

Table 3: Resistant pattern of Antibiotic in bacterial isolates from patients with suspected UTI.

Organisms	E.coli (n=101)	Klebsiella (n=(25)	Pseudo monas (n=13)	Proteus sp. (n=3)	Cons (n=22)	Cops (n=12)	Entero Coccus (n=11)
Amikacin/ Gentamycin	12 (12%)	06(24%)	03(23%)	01(33%)	NA	01(8%)	0
Cefuroxime	80(79%)	22(88%)	11(85%)	03(100%)	12(54%)	05(42%)	11(100%)
Ceftizoxime	71(70%)	20(80%)	10(77%)	02(67%)	15(68%)	05(42%)	11(100%)
Ceftriaxone	70(69%)	19(76%)	10(77%)	02(67%)	10(45%)	05(42%)	11(100%)
Ceftazidime + clavulanic acid	33(33%)	11(44%)	05(38%)	01(33%)	NA	NA	NA
Cefoperazone + sulbactam	22(22%)	11(44%)	04(30%)	01(33%)	NA	NA	NA
Cefixime	75(74%)	22(88%)	13(100%)	02(67%)	17(77%)	05(42%)	11(100%)
Vancomycin	NA	NA	NA	NA	0	0	0
Azithromycin	NA	NA	NA	NA	13(33%)	04(33%)	09(81%)
Amoxycillin + clavulanic acid	84(83%)	22(88%)	13(100%)	03(100%)	10(45%)	05(42%)	07(63%)
Ampicillin + Sulbactam	73(72%)	18(72%)	13(100%)	03(100%)	08(36%)	05(42%)	07(63%)
Piperacillin + tazobactam	18(18%)	07(28%)	05(38%)	01(33%)	NA	NA	NA
Ciprofloxacin	63(62%)	14(56%)	07(54%)	01(33%)	08(36%)	01(8%)	08(73%)
Levofloxacin	51(50 %)	13(52%)	07(54%)	01(33%)	07(32%)	0	08(73%)
Co trimoxazole	78(77%)	17(68%)	13(100%)	03(100%)	13(33%)	04(33%)	08(73%)
Linezolid	NA	NA	NA	NA	0	0	0
Aztreonam	61(60%)	19(76%)	10(77%)	02(67%)	NA	NA	NA
Imipenam	02(2%)	0	0	0	NA	NA	NA
Meropenam	02(2%)	0	0	0	NA	NA	NA
Nitrofurantoin	04(4%)	06(24%)	13(100%)	03(100%)	03(14%)	0	01(9%)
Clindamycin	NA	NA	NA	NA	11(50%)	0	NA

The overall susceptibility profiles of bacterial isolates are shown in Table 3. Amongst gram negative bacilli, amox-clav and cefuroxime had the highest overall resistance followed by Ampicillin -Sulbactam, Cefixime, Ceftizoxime, Co trimoxazole whereas other drugs showed sensitive pattern. Cephalosporins were most resistant drugs in gram positive bacilli followed by amox-clav, Azithromycin, Ampicillin- Sulbactam, Co trimoxazole, Ciprofloxacin, Levofloxacin, Clindamycin, Nitrofurantoin.

DISCUSSION

Urinary tract infection is huge burden on health care due to high prevalence of infection in both community and nosocomial settings. It is caused by variety of pathogens including *E. coli*, *K. pneumoniae* and *P. aeruginosa*. Continuous surveillance of antibiotic susceptibility patterns of uropathogens at local level is crucial in dealing with emerging problems of antibiotic resistance and provides assistance in managing effective initial therapy.[4] In present study, the prevalence of UTI in females is higher than the males which is attributed to factors like close proximity of the uretheral meatus to the anus, shorter urethra. This finding is consistent with other studies done by Jubina Bency et al Prakasam A., K.C et al and Azra S. Akram T et al. There was significant growth of E.Coli, Klebsiella, Enterococci, Staphylococcus and Pseudomonas. Ecoli & Klebsiella infections were most common organisms similar to Jubina Bency et al. *Enterococcus* was sensitive to Vancomycin & Linezolid. *Staphylococcus* was sensitive to Vancomycin.[6] The pattern of antimicrobial resistance of the micro-organisms causing UTIs vary in their susceptibility to antimicrobials from place to place and from time to time. World wide data shows that there is an increasing resistance among UTI pathogens to convential drugs. Resistance has emerged even to newer more potent antimicrobial agents.

E.coli(52 %) was the most common organism, followed by Klebsiella(13%), CoNs(11%), Pseudomonas(7%), CoPs(6%), Enterococcus(6%) Candida Sp. (3%) and Proteus Sp.(2%). This finding patterns were similar with the study of Savitha like E.coli(48.04%), Klebsiella species(8.82%) and Proteus spp.(4.90%).

It has been observed that there is slow but persistent decrease in the sensitivity of gram negative and gram positive bacteria to some quinolones derivative, Ampicillin and Sulphonamides which is alarming because these antibiotics have been one of the best options for treatment of UTI in both outdoor patients and hospitalized patients. Other factors which may influence

the sensitivity of urinary pathogens includes, routes of administration, dosage schedule, choice of antibiotic, misuse of antibiotic and condition of patients and self-medication.[7]

CONCLUSION

In this study, higher prevalence rates of urinary bacterial isolates are observed in females the most commonly found organisms were *E. coli* and *Klebsiella*. There is an emerging resistance of commonly isolated bacteria to routinely used antibiotics, which can be ascribed to inappropriate antibiotic administration. Important infecting organisms are found to be the commensals of perianal and vaginal regions, emphasizing a need to have proper hygienic practices.

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