RESEARCH ARTICLE

ANTIMICROBIAL PROFILE OF URINARY PATHOGENS TO DETERMINE EMPIRICAL THERAPY FOR URINARY TRACT INFECTIONS IN A RURAL TEACHING HOSPITAL OF WEST BENGAL

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ABSTRACT:

Background: Urinary tract infection (UTI) remains one of the common infections in OPD as well as hospitalized patients with significant morbidity. To acquire knowledge of pathogens and their antibiotic susceptibility pattern area specific studies are necessary to establish an appropriate empirical therapy. **Aim**: To see the drug resistance patterns of bacterial uropathogens to antimicrobials in our setting. **Study design:** One year ,Retrospective study (March 2011 to February 2012) **Material and methods**: Sent sample from different OPD and IPD were processed by culture on CLED medium to isolate the organism/s. Different biochemical test were used to identify the organism/s. Antibiotic sensitivity testing(AST) were done on Muller Hinton agar by the Kirby Bauer disk diffusion method . The results of AST were analyzed. **Results:** *E.coli* (53.6%) was observed to be the predominant uropathogen followed by enterococcus (15.5%). Among fermentative Gram negative bacilli (GNB) commonly isolated *E.coli* showed maximum resistance to aminoglycosides eg gentamicin 53.6%, Fluroquinolones eg ciprofloxacin 64%, third generation cephalosporins ie ceftriaxone 62.9% and among Gram positive organisms ciprofloxacin resistance were as high as 40%. However imipenam was found to be most effective drug against GNB followed by nitrofurantoin and Vancomycin agaist gram positive organisms followed by nitrofurantoin again. Conclusion: Nitrofurantoin found to be most useful antibiotic affective against both gram negative and gram positive organisms can be given orallyalso highlighting the main advantage of this drug.

Key words: Urinary tract infection (UTI), Uropathogens, Empirical treatement.

INTRODUCTION:

Urinary tract infections (UTIs) are one of the most common infectious diseases seen in the clinical practice and community. It has been estimated that nearly 10% of the human population will experience a UTI during their life time [1]and the commonest bacterial agent involved in causation of UTIs is *Escherichia coli*, both in the community as well as in the hospital [2]. Treatment outcome of UTIs varies according to the age of the patient, sex, underlying disease and infecting agent, but broad spectrum antibiotics over specific antibiotics for empirical antibiotic therapy, poor patient compliance, and incomplete course of antibiotic therapy have resulted in the evolution of resistance to commonly used antibiotics. The use of antibiotics have an influence in the spread of [3,4] antimicrobial resistance among bacteria. Though the prevalence and antimicrobial resistance pattern may vary between geographical areas, site of isolation and different environmental factors the local data about the antimicrobial resistance of uropathogens should be available for proper therapeutic interventions of UTI. The present study was undertaken to assess the antimicrobial resistance pattern among uropathogens to determine the empirical therapy for UTI in community as well as in hospital in our set up.

MATERIAL AND METHODS:

Design & Setting: The study was carried out in the department of Microbiology, College of Medicine and JNM Hospital kalyani, west-Bengal during March 2011 to February 2012. This was an analysis of data generated from the records of consecutive urine samples received in the laboratory from hospital's indoor and outdoor during the study period. Only the initial sample of an individual received was included to avoid duplication. Analysis of antibiotic susceptibility data of all isolates were reviewed and analyzed.

Majority of the samples were midstream clean catch urine followed by catheterized urine samples. Samples were processed and isolates were identified according to standard guidelines [5]. Inoculation of all urine samples were done by calibrated loop technique delivering 0.005 ml of urine onto Cystine-Lysine-Electrolyte Deficient (CLED) medium (Himedia) and were incubated for 18-24 h at 37˚C. Depending upon the number of the colonies grew on the CLED medium, the interpretations of urine culture were made as insignificant (<50 colonies), doubtful significance (>50 to<500 colonies) and significant (≥500 colonies) with due clinical correlation as per recommendations [5,6] . The antibiotic susceptibility testing of the isolated bacteria was carried out by the Kirby Bauer disk diffusion method [6,7]. ATCC *E.coli* 25922, *Enterococcus* 29212 were used as a control.

RESULTS:

Data from a total of 1092 consecutive urine samples were included in the study. Out of these, 731 (67%) were sterile, 181 (16.6%) showed significant growth, 22 (2%) showed insignificant growth and 158 (14.5%) were found to be contaminated. Out of the 181 culture positives, we isolated 65.75% gram negative (n=119) and 34.25% gram positive (n=62) bacteria. *Escherichia coli* was the most predominant (54%) isolate followed by *Enterococcus spp* (15%), *Staphylococcus aureus* (10%), *Klebsiella sp* (10%), *CONS* (8%), *pseudomonas sp* (1%), *Proteus sp and Acinetobacter species* (1%) **(Table1 and Figure 1)**. More

number of organisms (86.7%) was isolated among outdoor patients showed female predominance **(Figure 2)**

Analyzing the sensitivity and resistance pattern of isolates to different antibiotics 64% of all *E.coli* isolates was found to be resistant to ciprofloxacin. Ciprofloxacin resistance was comparatively less among the K*lebsiella* and other Gram-negative uropathogens like *Pseudomonas spp* and *Acinetobacter* **(Table-2)**. Among amino-glycosides, gentamicin resistance was showed by both fermentative GNR *E.coli* and *Klebsiella* (53.6% and 55.5%) in a maximum numbers as compared to Amikacin (29.9% and 27.7%). The percentage of isolates of *klebsiella* resistant to ampicillin was found to be as much as 94.4 per cent, higher than *E.coli* (79.4%). The rates of resistance among Gram-negative uropathogens to third generation cephalosporins like ceftriaxone and ceftazidime were high. Ceftriaxone resistance were seen in 62.9 and 61.1 per cent by all isolates of *E. coli* and *Klebsiella sp.* but among Gram- negative non-fermenters (n=3) none of them was resistant to ceftazidime . Compared to other Gram-negative uropathogens, resistance to the urinary antiseptic nitrofurantoin was comparatively less among isolates of *E. coli*. Amongst the Gram-positive isolates, *Enterococcus faecalis* was the most commonly isolated organism (n=28) with 0 per cent resistance to vancomycin however substantial number of *Saphylococcu aureus* (n=19), and *CONS* (n=15) isolates were resistant to ciprofloxacin (37% and 40%) **(Table-3)**. Resistance to nitrofurantoin was comparatively more amongst the S*taphylococcus aureus* ; however we identified 47.4% MRSA strains (Oxacillin resistance) while analyzing the samples.

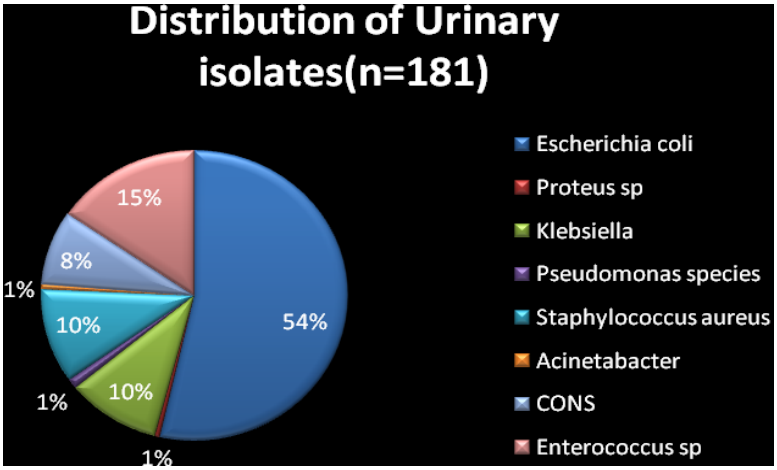

Figure 1: % Distribution of urinary isolates (n=181)

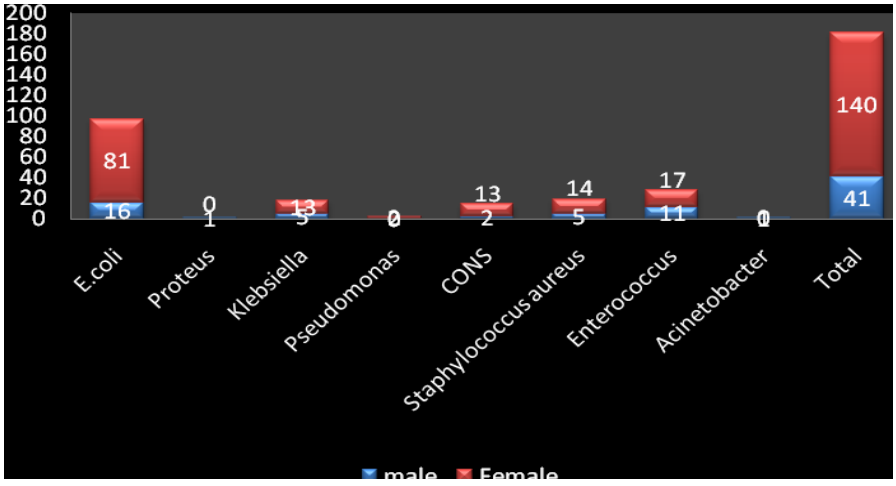

Figure 2: Male and Female distribution of isolates(n=181)

Table 1: Indoor and outdoor distribution of urinary isolates (n=181)

Organisms	Indoor	Outdoor	Total (%)
Escherichia coli	13	84	97(54)
Klebsiella sp.	4	14	18(10)
Proteus sp	1	0	1(1)
Pseudomonas species	2	0	2(1)
Acinetobacter species	0	1	1(1)
Staphylococcus aureus	1	18	19(10)
CONS	1	14	15(8)
Enterococcus sp	4	24	28(15)
Total number of Organism	**24(13.3%)**	**157(86.7%)**	**181**

CONS=Coagulase negative staphylococcus.

Table 2: Antibiotic susceptibility pattern of the Gram- negative isolates (% resistance)

Antibiotics	*E.coli* n=97	*Klebsiella sp* n=18	*Proteus sp* n=1	*Pseudomonas* n=2	*Acinetobacter* n=1
Ampicillin	77(79.4)	17(94.4)	1(100)	1(50)	1(100)
Gentamicin	52(53.6)	10(55.5)	0(0)	0(0)	0(0)
Ceftazadime	53(54.6)	11(61.1)	0(0)	0(0)	0(0)
Ceftriaxone	61(62.9)	11(61.1)	0(0)	1(50)	0(0)
Amikacin	29(29.9)	5(27.7)	0(0)	0(0)	0(0)
Ciprofloxacin	62(64)	10(55.5)	1(100)	0(0)	0(0)
Imipenem	9(9.3)	0(0)	0(0)	1(50)	0(0)
Nitrofurantoin	17(17.5)	6(33.3)	0(0)	1(50)	0(0)

Table 3: Antibiotic susceptibility pattern of the Gram- positive isolates (% resistance)

Antibiotics	*Enterococcus* (n=28)	*St.aureus* (n=19)	*CONS* (n=15)
Penicillin	9(32)	8(42)	7(46.7)
Ampicillin	13(46.5)	6(31.6)	7(46.7)
Tetracycline	11(39.3)	4(21)	5(33.3)
Ciprofloxacin	15(53.7)	7(37)	6(40)
Nitrofurantoin	4(14.3)	5(26.5)	2(13.3)
Oxacillin	10(36)	9(47.4)	4(27)
Vancomycin	0(0)	0(0)	0(0)

DISCUSSION:

Majority of the treatment of UTI begins or done totally empirically. Hence to avoid the emergence of bacterial resistance knowledge about common uropathogens and their regional susceptibility pattern is crucial to optimize the therapeutic strategy. In India prevalence of uropathogens ranges from 10.86% to 45.32% [8,9] . In the present study 16.6% samples yielded significant pathogens. More number from outdoor patients (86.7%) reflects the problem of UTI in the community at large scale as well as in hospitals. Majority of uropathogens were enteric GNB (65.7%) followed by GPC (34.3%). This is in accordance with other studies [8,9]. In our study *E.coli* (54%) was observed to be the predominant uropathogen followed by enterococcus (15%). The proportion of bacterial species isolated was similar to those described in previous studies[10,11,12] however the data from different study sources [13,14,15,16] showed that E.coli and klebsiella sps are still the commonest uropathogens isolated among UTI patients. Generally uncomplicated UTIs are treated empirically in the community with short courses of oral antibiotics. In most cases microbiological evaluation of UTI cases were conducted only following treatment failure, recurrent of relapsing infection. Antimicrobial resistance is emerging as a big problem for public health which threatens the lives of hospitalized patients increasing the health care cost and hospital stay.

The present study revealed that among gram negative bacteria's the common isolate *E.coli* were highly resistant to commonly used empirical antibiotics beta lactams (ampicillin) and fluroquinolones (ciprofloxacin) in our area. Our reports are consistent with other studies [13, 10,17] conducted in India . These high resistance rates among uropathogens may be because of poor access of health care services, using antibiotics without culture sensitivity which generate, maintain and spread the resistant strains in the community. Our findings thus suggest that empirical treatment with these drugs should no longer be appropriate. Amino glycosides i.e. Amikacin showed low resistant rate among *E.coli* (29.9%) and *Klebsiella* (27.7%). Imipenam were highly effective against *E.coli* [18,19,20] and *Klebsiella sp* where as Akram et al [19] showed 88% sensitivity of imipenam against *klebsiella pneumonia*, this may be because of local variation of drug susceptibility in different hospitals. Nitrofurantion and imepenam were highly effective against *E.coli* and *klebsiella* however the multidrug resistance showed by *Klebsiella sp* were same like *E.coli*. However aminoglycosides and imipenam being injectables are used less commonly in the community care setting and hence have shown better sensitivity rates.

Gram positive cocci were found to be highly resistant to penicillin, ampicillin and ciprofloxacin. Vancomycin showed to be highly effective drug followed by nitrofurantoin also showed by other studies [8,9,18,21,19] . Low resistant to nitrofurantoin possibly is because of its multiple mechanism of action despite being used for many years in UTI [21]. Better activity of nitrofurantoin had also been reported from studies conducted in different parts of india [10,17] .

CONCLUSION:

In our study most useful antibiotic found to be nitrofurantoin affective against both gram negative and gram positive organisms can be given orally highlighting the main advantage in outdoor patients. *E.coli* again showed the most predominant uropathogen. Multidrug resistance to commonly used antimicrobials in uropathogens has caused considerable alarm which suggests the importance of judicious use of antimicrobials .As imipenam was the most promising drug among Gram negative and vancomycin among gram positives, can be considered as the alternative option in the empirical treatment of UTI. MRSA isolates are also prevalent in our institute as uropathgens. It is essential to report these isolates along with the routine susceptibility testing, as this will help clinicians in selecting out proper antimicrobial agent.

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