

# PREVALENCE OF ANTIMICROBIAL RESISTANCE IN UROPATHOGENS AND DETERMINING EMPIRICAL THERAPY FOR URINARY TRACT INFECTIONS

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## ABSTRACT

Analyzing antibiotic susceptibility pattern of Uropathogens helps to overcome the therapeutic difficulties created by the emerging antimicrobial resistant bacteria and guides in choosing appropriate empirical therapy. The aim of the study is to understand the susceptibility patterns of the uropathogens which assists in choosing the empirical therapy for UTI. Midstream urine samples were collected cultured and subjected to microscopical and appropriate biochemical tests for proper identification. Antimicrobial sensitivity tests were carried out by disc diffusion technique using Muller Hinton Agar. High level resistance is seen to Cotrimoxazole, Ciprofloxacin, Ceftazidime and Cefipime. Amikacin and Nitrofurantoin were found to be more effective against the isolates. Most of the isolates were sensitive to Imepenem. From our study, Nitrofurantoin is recommended for community acquired UTI and Amikacin for hospital acquired UTI as Empirical treatment.

**Key-words** : Antibiotic resistance, Empirical Treatment, UTI.

## INTRODUCTION

Infections of the urinary tract are among the most common infectious diseases in humans<sup>[1,2]</sup> Intestine is usually the source of organisms producing UTI.<sup>[7,8,9]</sup> Antimicrobial resistance occurs in intestinal bacteria due to antibiotic therapy for treating infections outside the urinary tract.<sup>[8]</sup> The use of antibiotics have an influence in the spread of antimicrobial resistance among bacteria.<sup>[10,11,12,13,14]</sup> The local data about the antimicrobial resistance of Uropathogens should be available for proper therapeutic interventions of UTI. Our study is to analyze the antimicrobial resistance pattern among Uropathogens and to determine the empirical therapy for UTI in community and hospital set up.

## MATERIALS AND METHODS

A total of 656 urine samples were collected from the out patients and inpatients in our hospital during the study period (Jan2010 – Aug 2010). The mid-stream urine specimens were obtained by clean – catch method. The samples were collected in sterile containers and cultured within one hour of collection. The samples were plated out on MacConkey and Blood agar media and incubated aerobically overnight at 37°C.<sup>[16-18]</sup> Samples that showed pure growth of isolate in a count of  $\geq 10^5$  colony-forming units (CFU) per ml of urine after overnight incubation were considered to indicate significant bacteriuria.<sup>[9]</sup> The characteristic bacteria on the culture media were aseptically isolated and subjected to microscopical and appropriate biochemical tests for proper identification.<sup>[16]</sup> Antimicrobial sensitivity tests were carried out by disc diffusion technique using Muller Hinton Agar. E. coli ATCC strain 25922 susceptible to all the antibiotics was used as control. The Antibiotics used for susceptibility testing in our study were Cotrimoxazole (COT), Amikacin (AK), Ciprofloxacin (CIP), Ceftazidime (CAZ), Cefipime (CPM), Imepenem (IPM) and Nitrofurantoin (NIT).

Organisms	IP	OP	TOTAL
Escherichia coli	68	21	89
Klebsiella species	23	9	32
Pseudomonas aeruginosa	19	0	19
Proteus species	5	1	6
Acinetobacter species	2	0	2
Staphylococcus aureus	2	1	3
Enterococcus faecalis	2	0	2

TABLE : 1 – DISTRIBUTION OF ORGANISM IN IP AND OP

Organisms	AK %		CAZ %		CIP %		IPM %		COT %		CPM %		NIT %	
	S	R	S	R	S	R	S	R	S	R	S	R	S	R
Escherichia coli	56	44	16	84	38	62	94	6	19	81	33	67	82	18
Klebsiella species	68	32	40	60	52	48	92	8	20	80	68	32	92	8
Pseudomonas aeruginosa	53	47	37	63	42	58	95	5	5	95	53	47	-	-
Proteus species	67	33	50	50	50	50	100	0	17	83	83	17	67	33
Acinetobacter species	50	50	0	100	0	100	100	0	0	100	100	0	0	100
Staphylococcus aureus	100	0	75	25	75	25	100	0	50	50	100	0	-	-
Enterococcus faecalis	75	25	0	100	0	100	100	0	0	100	0	100	0	100

TABLE : 2 – SENSITIVITY AND RESISTANCE OF ORGANISMS TO ANTIBIOTICS

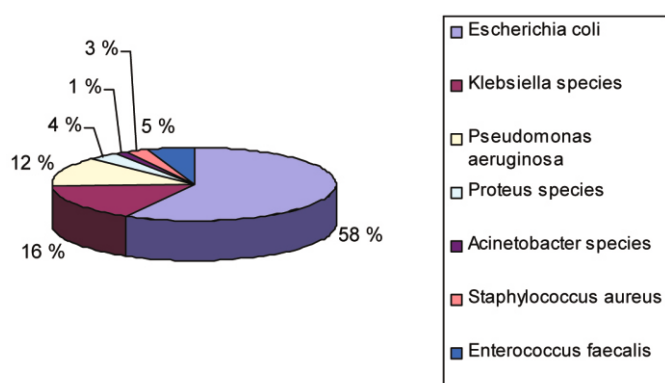


Fig. 1 DISTRIBUTION OF ORGANISMS IN UTI

## RESULTS

Bacterial organisms were isolated from the urine of 153 patients (Both from IP and OP) during the study. Uropathogens isolated are shown in Fig 1.

Table 1 shows that E. coli predominated in both inpatients and outpatients followed by Klebsiella spp. It is clearly indicated in this table that Pseudomonas spp., Acinetobacter spp. and Enterococcus spp. are pathogens of UTI only in inpatients and not in outpatients.

Table 2 shows the Sensitivity and Resistance pattern of isolates to different antibiotics. High level resistance is seen to Cotrimoxazole, Ciprofloxacin,

Ceftazidime and Cefipime. Sensitivity of Nitrofurantoin to Pseudomonas and Acinetobacter were not tested as they have intrinsic resistance to that drug. But Nitrofurantoin showed 87 % of sensitivity for the other organisms. Amikacin is found to be very effective against all the isolates. Most of the isolates were Sensitive to Imepenem.

## DISCUSSION

This study shows that the pathogens causing UTI in community and hospital set up show almost same percentage of resistance. In the previous studies the resistance to antibiotics was more in the hospitalized patients than in the community.<sup>[19]</sup> This indicates the spread of multi drug resistant strains in the community. In the present study, E. coli predominated amongst the hospital as well as community patients,<sup>[20]</sup> Klebsiella spp. being the second commonest in both the patient groups. It is noticed that Pseudomonas aeruginosa is responsible only for UTI in hospitalized patients.

From this study, it is obvious that Cotrimoxazole is no more useful against Uropathogens as only 17 % of the isolates were susceptible for that drug. Previously this antibiotic was used as the drug of choice for empirical treatment of UTI.<sup>[21]</sup> The broad spectrum activity of Fluoroquinolones has made

them as one of the best therapeutic options for UTI. In the present study the isolates showed low degree of susceptibility (40%) to Fluoroquinolones which indicates that they can no more be opted for treating UTI.

It is obvious from our study that there is increased resistance for 3GC (76%) and 4GC (56%) antibiotics like Ceftazidime and Cefipime. This is an indication that many of the organisms are ESBL and Amp C producers.<sup>[22]</sup> For these organisms, drugs with inhibitors like Augmentin may be tried<sup>[22]</sup> but, which should be reserved for the last line of treatment. Very less number of organisms are resistant to Imepenem (2 %) which shows that carbapenemase producing strains are not much in our study. Carbapenems are the final therapeutic option for any infection. But it is advocated that they should be used as a last line antibiotic to prevent the occurrence of carbapenem resistance. Hence they cannot be given for empirical treatment.

Antimicrobial resistance for Nitrofurantoin has not occurred much attributed to its localized action only on the urinary tract and hence not exposed outside the urinary tract<sup>[23]</sup>. The susceptibility pattern of Nitrofurantoin is satisfactory in our study as its activity on the urinary isolates is very effective. Since *Pseudomonas* spp. and *Acinetobacter* spp. have intrinsic resistance to Nitrofurantoin, testing sensitivity of *Pseudomonas* against Nitrofurantoin is of no use. As our study indicates, both these have roll to play only in UTI in Hospital setup. It is shown in our study that Nitrofurantoin has tremendous effect (87%) against other Uropathogens ( *E.coli*, *Klebsiella* spp., *Proteus* spp., *Staphylococcus aureus* ) which are responsible for UTI in community setup. Hence our study recommends Nitrofurantoin as the drug of choice for empirical treatment in community acquired UTI. .

Amikacin also has showed strong activity against about 60% of organisms including *Pseudomonas*, *Acinetobacter* and all the other organisms responsible for UTI in Hospital setup. With this evidence from our study, we can suggest Amikacin to be prescribed as the empirical treatment for UTI in Hospital. But keeping the emerging antimicrobial

resistance in mind, it is strongly suggested that the antibiotic therapy should only be commenced after the sensitivity report from the Microbiology laboratory. This would not only help in the prudent use of antibiotics but also would curb the dissemination of antimicrobial resistant strains in the community as well as in the hospital.

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