AMERICAN JOURNAL OF PHARMTECH RESEARCH

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"A cross sectional study (prevalence rate (%)) on antibiotic drug sensitivity pattern in gram-negative and gram-positive uropathogens in tertiary care hospital in India

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ABSTRACT

An organism is called "susceptible" to a drug when the infection caused by it is likely to act in response to treatment with this drug, at the suggested dosage. There are many bacterial species, including E.coli are showing an increasing resistance to antibiotics and E.coli is an important pathogen of urinary tract. The growing Prevelance of antimicrobial resistance is a most important health problem and is linked with high morbidity and mortality. Antimicrobial susceptibility pattern of gram negative was observed towards Nitrofurantoin (55.38%) followed by Cotrimaxazole (22.96%), amikacin (25.93) and Ceftriaxone (12.85%) in case of E.coli and Klebsiella. Enterococcus shown maximum sensitivity to linezolid (89.11%) followed by Nitrofurantoin (51.69%), but ofloxicin (9.7%), Imipenem (9.41%) and Amikacin shown very low sensivity. So, the decision on selection of antibiotic therapy should be made in discussion with microbiologist and pharmacist.

Keywords: Antibiotic sensitivity, prevalence rate, E.coli, Staphylococcus, monitoring of antibiotics.

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Received 28May 2014, Accepted08June2014

Please cite this article as: Basappa K *et al.*, A cross sectional study (prevalence rate (%)) on antibiotic drug sensitivity pattern in gram-negative and gram-positive uropathogens in tertiary care hospital in India. American Journal of PharmTech Research 2014.

INTRODUCTION

Antibiotic resistance is a global concern, mainly vital in developing nations, including India. Antibiotic resistance mainly occurring by overuse and misuse partly due to wrong diagnosis, irrational and imitational antibiotic market combinations, and irregular utilization due to either incorrect prescription or poor observance all make a payment to the extensive drug resistance among the hospital acquired organisms.[1, 2]

Hospital acquired infections are not only increasing the healthcare costs but also the morbidity and mortality in hospitalized patients particularly the seriously sick patients in the intensive care unit (ICU) where a large number of drugs are administered to the patient' which in turn leads to the generation of antibiotic resistant pathogens[3, 4]

The mechanism of organisms causing infections and their antibiotic resistance development methods are vary widely from one nation to another. Presently, India not has any local or national level surveillance program, to guide on actual prevalence of resistance.[5]

There are many bacterial species, including E.coli are showing an increasing resistance to antibiotics and E.coli is an important pathogen of urinary tract. From many parts of the world multidrug resistance among E.coli isolates have been reported. The growing Prevalence of antimicrobial resistance is a most important health problem and is linked with high morbidity and mortality. Due to growing antibiotic resistance among uropathogens, it is vital to have confined hospital based knowledge of the organisms causing infections (like UTI) and their antibiotic sensitivity. [6, 7]

Aim and objective of the present study is to find out the prevalence rate (%) of antibiotic drug sensitivity (susceptibility) of gram negative as well as gram positive microorganisms isolated urine samples (Uropathogens), collected from various Inpatient and Outpatient deportments of Gauhati Medical College and Hospital, a tertiary care hospital in India.

MATERIALS AND METHODS:

This is a cross sectional retrospective study of eight months (August-2013 to March 2014), the data was collected from department of clinical microbiology, Gauhati Medical College and Hospital, Guwahati. All the urine samples are collected from various inpatient departments as well as outpatient like medical, surgical, ICU, nephrology and etc.

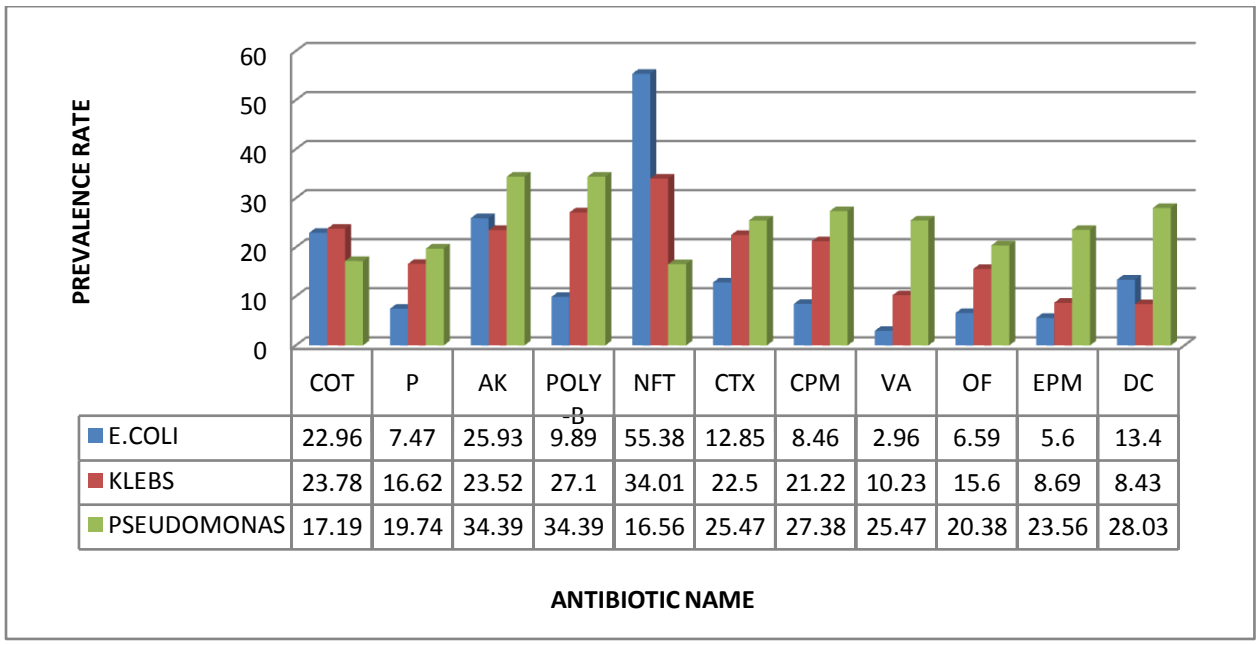
Fresh midstream urine samples were aseptically collected in sterile containers. Every urine sample was placed on 5% sheep blood agar and Macconkey agar plates using a calibrated loop, delivering 0.01 ml of sample. This was incubated at 37 degree Celsius overnight and the observation was

made next day. All the plates showing significant growth (>10 CFU/ml) as per kass count were further processed. Following biochemical detection, antimicrobial sensitivity testing was done for the isolates using Kirby-Bauer methods (Kirby-Bauer method is a diffusion susceptibility test is to determine the sensitivity or resistance of pathogenic aerobic and facultative anaerobic bacteria to various antimicrobial compounds proposed by Kirby and his colleague, A. W. Bauer in 1960s) on Mueller-Hinton agar (Mueller-Hinton **(**MH) agar is considered the best medium to use for routine susceptibility testing of no fastidious bacteria) and results were interpreted.

RESULTS AND DISCUSION:

Total of 9024 Urine samples were processed. Out of these 1940 uropathogens were obtained. Gram negative isolates were 1458(100%), the common most isolates were E.coli 910(62.43%) followed by the Klebsiella species 391(26.81%) And pseudomonas 157(10.76%) among Gram-positive organism 482(100%) in that Enterococcus 347(71.99%) and S.aureus 135(28.01%) Was most prevalent uropathogensobtained.

Table 1 shows antimicrobial susceptibility pattern of gram negative isolates. Among this maximum sensitivity was observed towards Nitrofurantoin (55.38%) followed by Cotrimaxazole (22.96%), amikacin (25.93) and Ceftriaxone (12.85%) in case of E.coli and Klebsiella, but amikacin (34.39%) and Polymyxin-B (34.39%) shown highly sensivity to pseudomonas. E.coli showed very low sensitivity to Vancomycin (2.96%), Cefepime (8.46%) and Imipenem (5.6%) shown in figure-1.



	COT	P	AK	POLY-B	NFT	CTX	CPM	VA	OF	EPM	DC
E.COLI	22.96	7.47	25.93	9.89	55.38	12.85	8.46	2.96	6.59	5.6	13.4
KLEBS	23.78	16.62	23.52	27.1	34.01	22.5	21.22	10.23	15.6	8.69	8.43
PSEUDOMONAS	17.19	19.74	34.39	34.39	16.56	25.47	27.38	25.47	20.38	23.56	28.03

Figure 1: Prevalence Rate of Antibiotic Drug Sensitivity of Three Gram-Negative Microorganisms

COT-Cotrimaxazole, P-Penicillin, AK-Amikacin, POLY-B- Polymyxin-B, NFT-Nitrofurantoin, CPM- Cefepime, VA-Vancomycin, OF-Ofloxicin, EPM-Imipenem, DC-Doxycycline.

Table 1: Antibiotic drug sensitivity pattern of gram- negative bacteria isolates.

Organism	COT	P	AK	POLY-B	NFT	CTX	CPM	VA	OF	EPM	DC
E.COLI	22.96	7.47	25.93	9.89	55.38	12.85	8.46	2.96	6.59	5.6	13.4
KLEBS	23.78	16.62	23.52	27.1	34.01	22.5	21.22	10.23	15.6	8.69	8.43
PSEUDO	17.19	19.74	34.39	34.39	16.56	25.47	27.38	25.47	20.38	23.56	28.03

COT-Cotrimaxazole, P-Penicillin, AK-Amikacin, POLY-B- Polymyxin-B, NFT-Nitrofurantoin, CPM- Cefepime, VA-Vancomycin, OF-Ofloxicin, EPM-Imipenem, DC-Doxycycline. Prevalence rate (%)

Table 2 shows antimicrobial susceptibility pattern of gram-positive isolates. These isolates shown sensitivity to all the community used antibiotics like vancomycin, linezolid and Nitrofurantoin. Enterococcus shown maximum sensitivity to linezolid (89.11%) followed by Nitrofurantoin (51.69%), but ofloxicin (9.7%), Imipenem (9.41%) and Amikacin shown very low sensivity. Staphylococcus showed good sensitivity to vancomycin (85.18%), Nitrofurantoin (60.74%), gentamycin (35.55%), Ceftriaxone (37.77%) and amikacin (44.44). But in case of Enterococcus this antibiotic showed very low sensitivity shown figure-2.

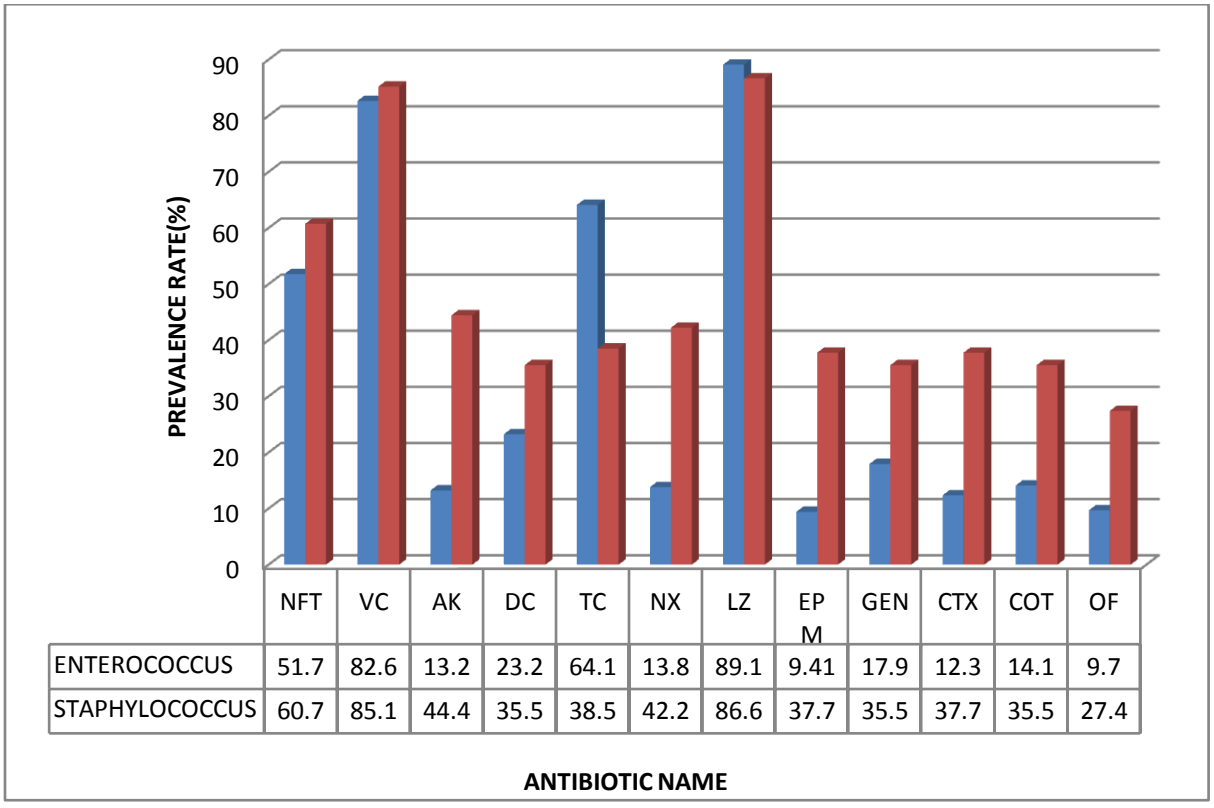


Figure 2: Prevalence Rate of Antibiotic Drug Sensitivity of Two Gram-Positive Microorganisms

NFT-Nitrofurantoin, VC-Vancomycin, AK-Amikacin, DC-Doxycycline, TC-Tetracycline, NX-Nalidixic acid, LZ-Linezolid, EPM-Imipenem, GEN-Gentamycin, CTX-Ceftriaxone, COT-Cotrimaxazole, OF-Ofloxicin.

Table 2: Antibiotic drug sensitivity patterns of gram- positive bacteria isolates.

Organism	Nft	Vc	Ak	Dc	Tc	Nx	Lz	Epm	Gen	Ctx	Cot	OF
Entero	51.79	82.64	13.23	23.23	64.11	13.82	89.11	9.41	17.94	12.35	14.11	9.7
Staphylo	60.74	85.18	44.44	35.55	38.51	42.22	86.66	37.77	35.55	37.77	35.55	27.4

In Microbiology laboratory urine is the most common specimen to be received. Nitrofurantoin was found a high susceptible against this urinary drug. The most common uropathogens obtained in our study is E.coli followed by Klebsiella. Higher sensitivity exhibited to quinolone antibiotics (Nitrofurantoin- having good bioavailability), aminoglycoside (amikacin-used in hospital acquired highly multidrug resistant gram-negative bacterial infections), cephalosporins (Ceftriaxone-having broad spectrum activity), in case of pseudomonas higher sensitivity exhibited by Polymyxin-B (mainly used in urinary tract infections) and aminoglycosides (amikacin).

Overall high sensitivity to all the primary line of drugs is observed in our study. Increased susceptibility to second line drug is also observed in our study which is quiet acceptable. The useful drugs for gram-positive organism (staphylococcus) observed in our study are vancomycin (Glycopeptide antibiotic) and Linezolid (synthetic antibiotic-Oxazolidonones class of drug) in case of Enterococcus. These antibiotics observed to be effective against these uropathogens, use of these drugs should be limited to indication in which this class of agents has obvious therapeutic advantages over other antimicrobial agents.

CONCLUSION:

These high rates of susceptibility and this information will directly affect selection of empiric therapy for different type of infection like UTI and no of other hospital acquired infection (nosocomial). So, the decision on selection of antibiotic therapy should be made in discussion with microbiologist and pharmacist. All recognized hospital should have a pharmacy and therapeutic committee that make available a functional forum for synchronized effort for wiser use of antibiotic and sustained appraisal of susceptibility pattern to conventional as well as new antimicrobial agents so as to establish the best possible empirical therapy.

Resistance to antibiotics poses a severe and growing problem, because such resistant bacteria are becoming trickier to treat. The empirical and the random use of antibiotics should be avoided in order to restrain the emergence and the spread of drug resistance among hospital acquired pathogens. These multidrug resistant isolates are also an indication for need of accurate and

updated population surveillance data and stringent infection control actions like universal safety measures and severe adherence to hand washing practices, surveillance activities, formulation of antibiotic policy, might be required for the same.

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