ANTIMICROBIAL SUSCEPTIBILITY TESTING OF CIPROFLOXACIN & CEFEPIME AGAINST STAPHYLOCOCCUS AUREUS & ESCHERICHIA COLI

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Abstract— Excessive and Discriminate usage of antibiotics is the major cause of microbal resistance to the majority of antimicrobial agents is a serious and global problem On the other hand high prevalence of drug resistance bacteria in the indigenous focal flora, lack of education poor standards of sanitation and prevalaence of malnutrition are the other contributing factors. This problem is at its extreme in developing countries like Pakistan. Therefore the development of the survilance program at National level is one of the most effective ways to control antibiotic resistance .To accomplish this task fifty clinical isolates of each of Staphylococcus aureus and Escherichia coli were collected from different hospitals and pathological laboratories in Karachi. These isolates were evaluated against Ciprotloxacin and Cefepime to investigate their susceptibility. The anti bacterial activity of Ciprofloxacin and Cefepime was carried out by disc diffusion method. Ciprofloxacin is 74 % and 68% sensitive to Staphylococcus aureus and Escherichia coli and shows 26% and 32% resistance respectively. Cefepime is 92% and 78% sensitive to Staphylococcus aureus and Escherichia coli and shows 8% and 22% resistance respectively. Hence it has been evaluated that all these clinical isolates have developed resistance to Ciprofloxacin and Cefepime. So that present study reinforce the adherenc to antibiotic control policy and regular susceptibility testing to tackle the problem of anti-micobial resistance.

Index Terms— Antimicrobials, cefepime, ciprofloxacin, Escherichia Coli, Staphylococcus Aureus, susceptibility testing, resistance.

1 INTRODUCTION

RESISTANCE to antimicrobial agents is a major and crushed issue from more than fifty years and considered as root cause of increased morbidity, mortality and health care cost. Inappropriate use of antibiotics is considered the major contributing factor; as well as, poor implementation of infection control measures, prolonged hospitalization, use of invasive procedures and admission to intensive care units the are other contributing factors. [1]

Predominent cause of nosocomial and community-acquired infections are Gram positive cocci such as Staphylococcus aureus. These organisms have ability to acquire resistance rapidly to frequently used drugs through selective pressure of environemnt and via the genetic evolution of bacteria [1]. Gram negative bacteria such as Escherichia coli acquire resistance to antibiotics as the result of gene mutation. [2]

Antibiotic resistance is considered to be direct consequence of antibiotic use in humans. Quinolones are broad-spectrum, bactericidal antibacterial agent have potent activity, even against intracellular pathogens, and ease of administration (oral, parenteral), has firmly established them both in the hospital and the community.The emergence of resistance is the natural response of microbes to the presence of antimicrobials, and it is generally accepted that the greater the consucmptions of antimicrobials,the greater will be the emergence of antimicrobial resistance [3]. Gram-positive and Gram-negative bacteria have been reported to be resistant to Quinolones. Three mechanisms of resistance have been established with Quinolones: alterations in target of Quinolones, bacterial cell permeability, and drug efflux mechanisms [4]. Plasmid-mediated resistance was also reported but its appears to be very rare compared with chromosomally mediated mechanisms of changes caused by point mutation in genes which are considered as the single major cause of resistance to Quinolones [5].

Cefepime is relatively new cephalosporin wth an extended spectrum of antibacterial activity that includes both aerobic Gram (-) and Gram (+) bacteria. The mechanism of

resistance to cephalosporin is the destruction of the cephalosporin by hydrolysis of the βlactams ring. Many Gram-positive micro organisms release relatively large amount βlactamase into the surrounding medium .Although Gram- negative bacteria seems to produce less βlactamase; the location of their enzyme in the preplasmic space may make it more effective in destroying cephalosporin as they diffuse to their target on the inner membrane. [6]

2 EXPERIMENT

A total of one hundred clinical isolates of Staphylococcus aureus and Escherichia coli were collected for culture and sensitivity from different hospitals and pathological laboratories in Karachi. After identification were cultured on slants containing Muller Hinton agar and stored at temp 2-4 °C. Before testing, isolates were brought to room temp. Mueller Hinton medium (Difco, Detroit,USA) was used to culture the islolate and identified by conventional techniques (Forbes BA). Antibiotic sensitvity test was done by Kirby Baeur disk difussion method.

Briefly

- Clinical isolates and the control strains were brought to room temperature and were cultured in Mueller Hinton broth tubes at 37°C for 2-4 hours so that, turbidity could be matched to Macfarland No 0.5 standard.
- Muller Hinton agar plates for cultured sensitivity were dried and labeled.
- Muller Hinton agar plates were seeded with test organism using sterile cotton swab.
- Disk of different antibiotic were then placed on agar using asterile forcep.
- Petri plates were incubated for 24 hours at 37°C prior to determination of result.
- A vernier caliper was used to measure the zone of inhibition. The zone diameter of each antibiotic disc was interpreted using criteria published by National Committee for Clinical Laboratory Standards USA (NCCLS).

3 RESULTS

The present study one hundred clinical isolates of Staphylococcus aureus and Escherichia coli. The isolates were collected from different pathological labs and hospital in Karachi and sensitivity pattern of determine by Kirby Baure Method as in Table No.1 and Graph No. 1 & 2.

The present study showed that 74% clinical isolates of Staphylococcus aureus and 68% Escherichia coli are susceptable to Ciprofloxacin.

92% clinical isolates of Staphylococcus aureus and 78% Escherichia coli are susceptable to Cefepime.

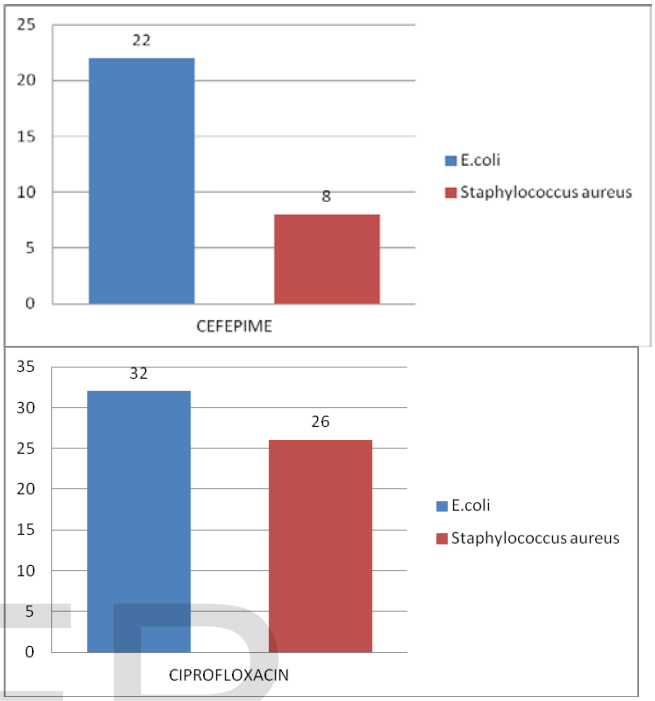

Fig 1&2 Percent resistance of Ciprofloxacin and Cefepime

Table: Percent resistance of Ciprofloxacin and Cefepime

Antimicrobial	Bacterial organism	Isloates (n)	% Susceptable	% Resistance
Ciprofloxacin	*E.coli*	50	68	32
	Staphylococcus aureus	50	74	26
Cefepime	*E.coli*	50	78	22
	Staphylococcus aureus	50	92	8

4 DISCUSSION

This study was conducted to findout the resistance pattern of Ciprofloxacin and Cefepime using E.coli and S.aureus to generate data regarding the antibiotic sensitivity pattern of these isolates. So that initiation of empirical thera-

py could be made more effective in infection caused by these isolates.

4.1 CIPROFLOXACIN

In the present study 32% clinical isolates of Escherichia coli were resistant to Ciprofloxacin

Low sensitivities of Escherichia coli was observed in this study is consistent with the earlier work. Eksi and coworkers in 2007 reported 35.8% resistance to E.coli. .AbdulRehman and coworkers in 2010 reported a gradual increase in resistance from year 2002 to2005 in most of gram negative isolates[7,8] .For E.coli resistance rate were 23.85% in 2002 to 33.1% in 2005. Although this high resistance of Escherichia coli to Ciprofloxacin was reported in our study, enhanced susceptibility had been reported by previous workers. Lauderdale in Taiwan reported 12% resistance to Ciprofloxacin[9]. Similarly (Richard et. al 2003) reported 19.5% resistance in Spain and 6% resistance in France in 2000-2001. [10]

The 26%resistance of Ciprofloxacin to Staphylococcus aureus as recorded in this work is in conformity with finding of of (Baqir et. al 2002) in which 26% Ciprofloxacin resistant Staphylococcus aureus was reported in strong agreement with published reports. [11,12,13] This finding was however different with the work of (Zhang et. al 2002) who reported 62.2% resistance.[14]

4.2 CEFEPIME

Ninety two percent (92%) clinical isolates of Staphylococcus aureus and seventy eight percent 78% of Escherichia coli are susceptible to Cefepime.

The result of this study indicated that Cefepime had highest sensitivity 92% to Staphylococcus aureus. This apparently high level of sensitivity to cefepime appears to suggest that Cefepime could be a drug of choice for treating infections caused by Staphylococcus aureus in the study area .This findings is consistent with previous reports .For instance, 100% susceptibility of Cefepime to Staphylococcus aureus has been reported . Sader in 2005 and Tallis in1999 reported 100% In addition, high sensitivities of Cefepime against methicillin sensitive Stapylococci was also highlighted by Douglas 1999. [15, 16]

Although low sensitivity of Escherichia coli 78% to Cefepime as observed in this study, enhanced susceptibilities had been observed by previous reporters. Douglas in 1999 reported susceptibility 97.5- 100.0 % to E.coli. Further, prio researchers Lewis in 1998 and Douglas in 1999 reported 91.7 % and 97.8% susceptibility of Cefepime to Escherichia coli. This difference can be attributed to the variation of resistance patterns to antimicrobials based on their usage.[17]

The encouraging finding in our study was the low percentage resistance to Cefepime. However, caution is required; the use of fluroquinolone drugs must be restrictive and discriminative so as to prevent a rapid development of drug resistance. Our study highlights the need for antimicrobial susceptibility pattern determination from time to time so that proper guidelines for hospital antibiotics policies can be developed. Hence this present study will be very useful for the pharmacist and physician for prescribing antimicrobial drug.

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