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Extended spectrum beta lactamase production, antibiogram pattern of *Klebsiella pneumoniae*

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ABSTRACT

Klebsiella pneumoniae is one of the potent pathogen causing noscomial infection in immunocompromised patients resulting in severe urinary tract and pneumonia infection. In recent years ESBL strains have been produced which shows multidrug resistant pattern in the most of the cases such as patients suffering from severe lung infection and UTI. In the present clinical isolates were procured from clinical laboratory and tested for ESBL producing strains by synergistic disc diffusion technique. Among the 50 isolates, 24 strains were ESBL producers which were resistant to both ceftazidime and cefotaxime. The obtained results show resistance towards the third generation cephalosporin drug.

Key words: *Klebsiella pneumoniae*, ESBL, ceftazidime, cefotaxime, cephalosporin

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INTRODUCTION

Klebsiella species, particularly *Klebsiella pneumoniae* are important causes of nosocomial infections *Klebsiella pneumoniae* may occur at almost all body sites, but the highest incidence is found in the urinary and respiratory tracts. The main population at risk is neonates, immunocompromised hosts and patients predisposed by prior surgery diabetes, malignancy. *Klebsiella*'s pathogenecity can be attributed to its production of a heat-stable enterotoxin. Infact, *K pneumoniae* is second only to *E coli* as a urinary tract pathogen. *Klebsiella* species may contain resistance plasmid (R-plasmids) which confer resistance to such antibiotics as ampicillin and carbencellin.

Klebsiella pneumoniae tend to affect people underlying disease, such as alcoholism, diabetes, and chronic lung disease. Classically, *Klebsiella pneumoniae* causes a severe, rapid-onset illness that after causes areas of destruction in the lung.

Sophia Abigail *et al* [1] reported ceftazidime resistance among *Klebsiella pneumoniae* in south india. They used fifteen strains of *klebsiella pneumoniae* resistant to ceftazidime that were tested for extended spectrum β lactamase (ESBL) production by double disc diffusion synergy test using ceftazidime and augmentin. All strains were found to produce ESBL. Their study also revealed imipenem was unaffected by these enzymes.

Earlier reports from other parts of the world show that 19% of *Klebsiella* from blood, urine, wound and sputum produced ESBL.

In the present study 50 *Klebsiella pneumoniae* strains were isolated from various clinical samples. Among 50, 24 strains were resistant to both ceftazidime and cefotaxime and all the 24 strains showed the evidence of ESBL production.

MATERIALS AND METHODS

COLLECTION OF CLINICAL ISOLATES - About 50 clinical isolates of *Klebsiella pneumoniae* was collected from SHARP Laboratories, Perambur, Chennai. The isolates were confirmed as *Klebsiella pneumoniae* by preliminary examination such as Gram's staining, Capsule staining inoculating on differential media and biochemical characteristics.

ANTIBIOTIC SUSCEPTIBILITY TESTING - Antibiotic susceptibility testing was done by Kirby – bauer method using the following antibiotics Gentamycin, Amikacin, Ciprofloxacin, Norfloxacin, Ofloxacin, Augmentin, Ceftazidime, Cefotaxime, Imepenem.

DETERMINATION OF CEFTAZIDIME RESISTANCE AMONG *KLEBSIELLA PNEUMONIA* ISOLATES - All the 50 isolates obtained in this study was tested for their susceptibility of cefotaxime on MHA by modified Kirby bauer disc diffusion technique. 24 isolates found to be resistant to both cefotaxime and ceftazidime were used in the following study that is determination of ESBL production among ceftazidime resistant strains.

DETERMINATION OF ESBL PRODUCTION – DOUBLE DISC DIFFUSION SYNERGY TEST - *klebsiella pneumoniae* was inoculated on MHA two discs, cefotaxime (30 mg/disc) and augmentin (20 mg amoxicillin and 10 mg of clavulanic acid) were placed of a distance of 30 mm and incubated at 37°C overnight. The organism was considered to produce ESBL, if the zone size around the ceftazidime disc, increased towards the augmentin disc. This increase occurs because the clavulanic acid present in the augmentin disc inactivates the ESBL produced by *klebsiella pneumoniae.*

RESULTS AND DISCUSSION

ISOLATION AND CHARACTERISATION OF *KLEBSIELLA PNEUMONIAE* - The organism was characterized as *klebsiella pneumonia* by various parameters such as gram's staining, motility, capsule staining, mucoidal colonies on mac conkey agar and various biochemical tests.

TABLE 1: Antibiotic Susceptibility pattern of KLEBSIELLA PNEUMONIAE isolate

ANTIBIOTIC	SENSITIVITY
Impenem	100
Gentamycin	62
Norfloxacin	58
Ofloxacin	46
Amikacin	44
Cefotaxime	32
Ciprofloxacin	16

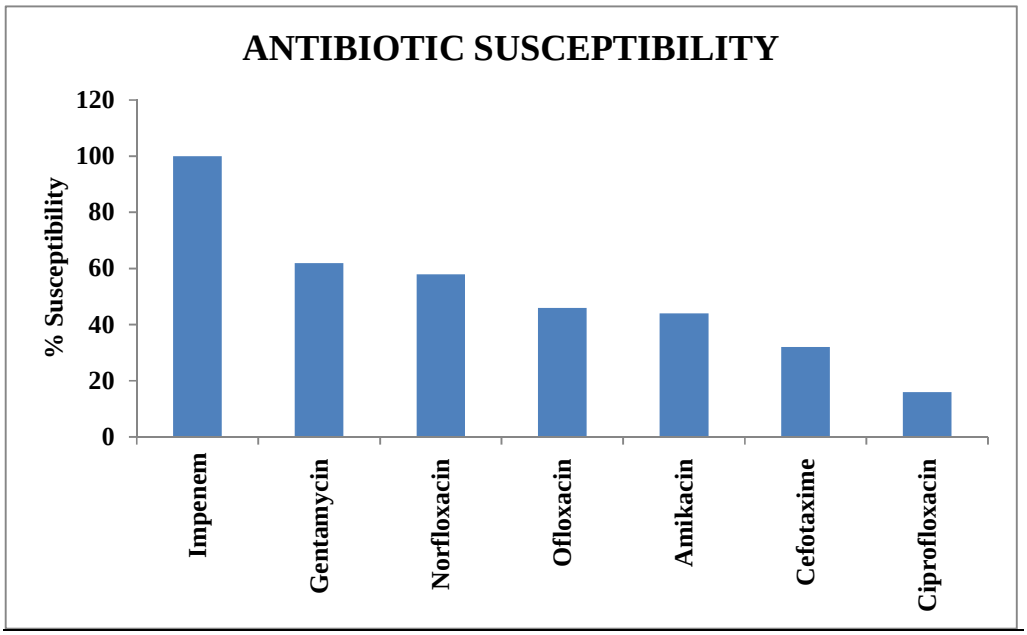

Figure showing antibiogram pattern of *klebsiella pneumoniae* against various antibiotic

The organism showed resistant to most of the antibiotics except impenam. All the 50 strains were sensitivity to impenam followed by Gentamycin 62%, Norfloxacin 46%, Amikacin 44%, Cefotaxime 32%, Ciprofloxacin 16%.

DETERMINATION OF ESBL PRODUCTION IN *KLEBSIELLA PNEUMONIAE* ISOLATE (RESISTANT TO BOTH CEFTAZIDIME & CEFOTAXIME)

24 strains (48%) resistant to both ceftazidime & cefotaxime were selected. All the 24 strains showed evidence of ESBL production. *Klebsiella* is one of the commonest pathogen responsible for hospital infection. *Klebsiella* is lately emerging as an important cause of neonatal nosocomial infection, including bacteremia and may be a leading cause of mortality. In the present study 50 strains of *Klebsiella pneumoniae* were isolated from various clinical samples.

Klebsiella pneumoniae resistant to third generation cephalosporin like cefotaxime and ceftazidime are being increasingly reported [1]. The third generation cephalosporins were initially active against Enterobacteriaceae since they are not inactivated by the inducible chromosome mediated class I B-lactamase [2]. However, drug pressure can result in over production of this enzyme & resistance which is not transferable [3]. Plasmid mediated resistance to third generation cephalosporin due to β-lactamase with extended spectrum of activity has been described in *Klebsiella pneumoniae* and other members of Enterobacteriaceae [4]. Following the first such report from Germany in 1985, several others appeared from sufficient parts of the world hospital outbreaks due to such strains are being increasingly reported.

In the present study reported that multiple drug resistance in a clinical isolated of *Klebsiella pneumoniae*. Our results also show that the resistance to third generation cephalosporin is mediated through ESBL in our area also. Imipenem is unaffected by these enzymes as was seen in this study. Resistance to third generation Cephalosporins, co-existed with resistance to several other antibiotics in this study. Presence of strain with capacity to produce ESBL will definitely limit the use of third generation Cephalosporins. Therefore the therapeutic option available in serious infection may become even more restricted, especially if the ESBL becomes widespread.

In the pathogenesis of UTI an initial process is the attachment of bacteria to uroepithelial cells, followed by colonization and damage to epithelium. In the present study, we found that the *Klebsiella* strains causing UTI have more strains isolated from various clinical samples. This is well in agreement with the reports [5].

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