Resistance of bacteria to antibiotics occurred well within a decade after the onset of antibiotic era. Antibiotic resistance has now been recognized as a phenomenon, which is emerging and reemerging time and again. We have now come to realize that bacterial evolution is finally surpassing the human capacity to create new antimicrobial agents. Several bacterial species have now become resistant to all commonly used antimicrobial agents, primarily in the hospital settings (Rahal *et. al.* 2002). Modern antibiotic development began with the chance observation of Fleming in 1928 that a contaminating *Penicillium* produced a substance that was lytic to staphylococci (Russell *et. al.* 1983). After extensive investigations were taken up both in Europe and United States, the antibiotics streptomycin, tetracycline, chloramphenicol, erythromycin, novobiocin and kanamycin were introduced in 1940s and 1950s. By 1960s the ability to substitute various side-chains in natural beta-lactams produced a large number of semi-synthetic beta-lactams of immense importance (Table 1). Newer beta-lactams like cephemycins, clavams, oxacephems, carbapenems, and monobactams have then been developed. Half a century later the problem of antibiotic resistance continues to plague our hospitals. Between 20 to 60% of nosocomial infections are thought to be caused by antibiotic resistant bacteria. Such infections increase morbidity and mortality rates and cause health-care costs to escalate (Lynch 2001).

Antimicrobial agents can be rendered inactive by five major mechanisms-

i. Inactivation of the antibiotic by structural modification or cleavage

ii. Prevention of access to target by altering the outer membrane permeability

iii. Alteration of the antibiotic target site

iv. Efflux pump which pumps out the antibiotic

v. Target enzyme bypass or overproduction.

The best known example of resistance due to inactivation is the opening of the beta-lactam ring of the antibiotics, penicillins and cephalosporins by beta-lactamases. Resistance to beta-lactam group of antibiotic is much higher than other antibiotics. The three principal mechanisms which cause resistance to beta-lactam antibiotics are -
a. The production of beta-lactamases that inactivate the drug through hydrolysis of beta-lactam ring (Spratt 1994) in both Gram-positive and Gram-negative bacteria.

b. Reduction in affinity of drug targets, both in Gram positive and Gram negative bacteria.

c. Alteration in outer membrane permeability that denies passage to the beta-lactams in Gram-negative bacteria.

The beta-lactamases may be produced by chromosomal or plasmid mediated genes (Thomson et. al. 2000). We now face modern pathogens with less predictable responses to beta-lactam therapy, and which are sometimes not reliably indicated by routine antibiotic susceptibility tests due to production of novel beta-lactamases.

Four groups of such beta-lactamases that have become increasingly important are:

(i) Extended spectrum beta-lactamase (ESBL)

(ii) Beta-lactamase with reduced sensitivity to beta-lactamase inhibitors (IRT-BL)

(iii) Plasmid-mediated AmpC beta-lactamases and

(iv) Metallo-beta-lactamases

There are more than 150 different types of beta-lactamases reported till date (Livermore 1995) which have been classified variedly by different group of scientists depending on (i) the substrate on which they work and (ii) whether they are inhibited by clavulanic acid, sulbactam, tazobactam etc. Our present study was undertaken to compare the antibiotic resistance pattern among various clinical isolates of Kolkata Hospitals. As maximum resistance was encountered to beta-lactam group of antibiotics, we wanted to find out and characterize the types of beta-lactamases produced by these clinical isolates. We wanted to determine the different types of beta-lactamases in Kolkata and their occurrence, because the information will be of immense therapeutic importance to the clinicians.