01. **Title: Incorporating Detection of Carbapenem Resistant Enterobacterales by Modified Carbapenem Inactivation Method (mCIM) and EDTA Carbapenem Inactivation Method (eCIM) in Surveillance Protocol, to Rationalize Antibiotic Therapy**

Harinee Murugan[1], Sheela Devi C[1], Sridevi D[1]

[1]Pondicherry Institute of Medical Sciences, Puducherry, India.

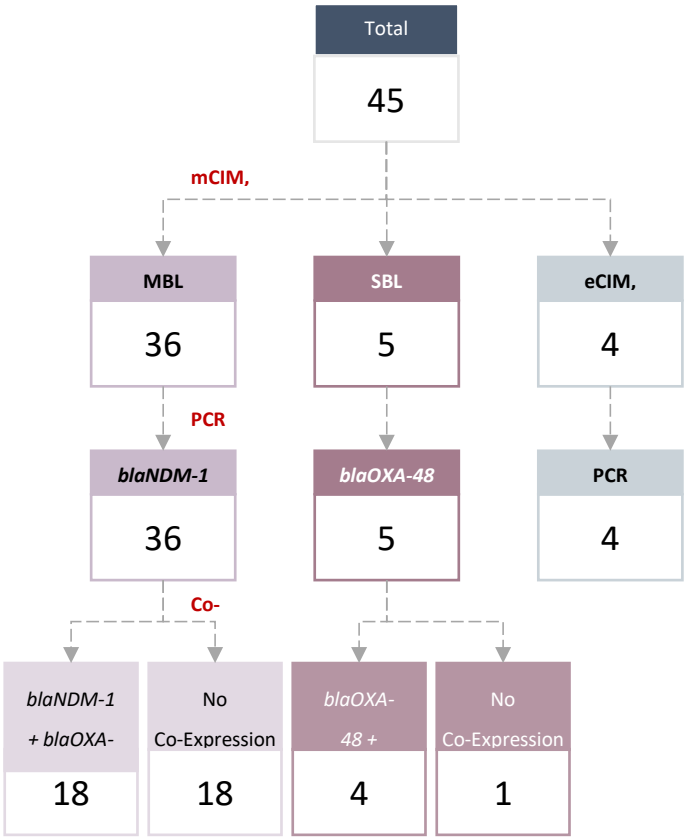
Background: Carbapenem-resistant Enterobacterales (CRE) are an emerging global public health threat associated with multidrug resistance, prolonged hospitalization, increased healthcare costs, and elevated mortality. Early identification of carbapenemase mechanisms is essential for effective antimicrobial therapy, infection-control practices, and antimicrobial stewardship. Differentiation between metallo-β-lactamase (MBL) and serine β-lactamase (SBL) producers is clinically important because SBL-producing isolates may respond to ceftazidime-avibactam, whereas MBL-producing isolates often require combination therapy with ceftazidime-avibactam and aztreonam. Modified carbapenem inactivation method (mCIM) and EDTA-carbapenem inactivation method (eCIM) are economical phenotypic assays that can reliably detect and differentiate carbapenemase-producing Enterobacterales. This study aimed to incorporate mCIM and eCIM into surveillance protocols for characterization of CRE isolates and rationalization of antibiotic therapy.

Methods: This retrospective cross-sectional study included 45 archived multidrug-resistant Enterobacterales isolates resistant to carbapenems, obtained from urine, blood, exudates, tissue, wound swabs, and sterile body fluids. Isolates were revived and identified using standard biochemical tests. Carbapenemase production was screened using mCIM and differentiated into metallo-β-lactamase (MBL) and serine β-lactamase (SBL) producers using eCIM according to CLSI 2023 guidelines. Real-time PCR was performed for detection of blaNDM-1, blaOXA-48, blaKPC, blaIMP, and blaVIM genes.

Results: Among the 45 isolates studied, Klebsiella pneumoniae (62%) and Escherichia coli (34%) were the predominant organisms. Phenotypic testing showed 36 (80%) isolates as MBL producers, 5 (11%) as SBL producers, and 4 (9%) negative for carbapenemase production. RT-PCR detected blaNDM-1 in 36 isolates and blaOXA-48 in 5 isolates, while blaKPC, blaIMP, and blaVIM were not detected. Co-expression of blaNDM-1 and blaOXA-48 was observed in 22 isolates. Most isolates demonstrated high resistance to β-lactams and fluoroquinolones, while tigecycline and minocycline retained comparatively better activity. Majority of patients recovered, with an overall mortality rate of 13%.

Key Words: Carbapenem-Resistant Enterobacterales; Carbapenemases; Metallo-Beta-Lactamases; Antimicrobial Resistance; Polymerase Chain Reaction

Figure or Table: Flowchart incorporating combined genotype and phenotype results for carbapenemase detection



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