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Characterization of carbapenem resistance in clinical isolates of Enterobactieraceae

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Background: Emergence of carbapenem resistance among clinical isolates of Enterobacteriaceae pose a major public health concern globally. Early and accurate detection of patients harboring carbapenem non-susceptible bacteria is crucial in hospital infection control and resistance transmittance between patients. Understanding the common mechanisms of resistance determinants of these bacteria is pivotal in developing effective screening methods in the laboratory.

Methods & Materials: A laboratory based exploratory study was undertaken in a clinical microbiology laboratory attached to a tertiary care teaching hospital in south India. Clinical isolates belonging to family Enterobacteriaceae that showed resistance to meropenem by Kirby Bauer disk diffusion testing were included in the study. Modified Hodge test (MHT), Metallo beta lactamase –double disk synergy testing (MBL-DDST) and MBL-combined disk test (MBL- CDT) were employed for phenotypic detection of carbapenamase production. A multiplex PCR targeting the detection of blaNDM, blaKPC, blaVIM, blaIMP and blaGIM genes was used for genotypic confirmation of resistance and detection of the resistance determinants.

Results: A total of 64 non-repetitive Enterobacteriaceae isolates comprising of 45 (70.3%) *Klebsiella pneumoniae*, 12 (18.8%) *Escherichia coli* and 7 (10.9%) *Enterobacter* spp., were included in the study. NDM, KPC, VIM, IMP were the resistance determinants detected using PCR among 50 (78%), 39 (60.9%), 4 (6.3%) and 3 (4.7%) of the 64 isolates tested. Presence of both NDM and KPC was observed in 34 (53%) isolates. Further, 13 (20.3%) and 42 (66.7%) of the isolates were ESBL and AmpC producers. MHT, MBL-CDT and MBL-DDST could detect carbapenamase production in 62 (96.9%), 64 (100%) and 50 (79.4%) of the isolates tested. MBL-CD test could detect carbapenamase production due to both KPC and MBL class of enzymes in all isolates, while MHT failed in detecting carbapenamase production among 2 isolates that were NDM and KPC positive by PCR.

Conclusion: From the present study, we observed that NDM and KPC are the major resistance determinants for carbapenem non-susceptibility in our settings. Further, we noticed the supremacy of MBL-CDT over MHT and MBL-DDST screening methods for detection of carbapenamase production among Enterobacteriaceae isolates.

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Multidrug resistant blood culture isolates: An experience from a tertiary care hospital in Eastern Nepal

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Background: Blood stream infections(BSI) remain a major cause of morbidity and mortality. Emergence of resistant microorganisms causing BSI has posed significant challenge to the clinicians and microbiologists alike. Surveillance of antimicrobial resistance is of utmost importance to track changes in microbial population, to select the appropriate therapy and to make recommendation in policy making. Present study was aimed to evaluate the antimicrobial resistance of blood culture isolates at BP Koirala Institute of Health Sciences (BPKIHS), a tertiary care teaching hospital in eastern Nepal.

Methods & Materials: Blood culture specimens submitted to Department of Microbiology were evaluated. Isolation, identification and determination of antimicrobial susceptibility was performed by standard microbiological techniques.

Results: Out of 11264 blood culture specimens processed over one year period ,1551(13.8%) yielded the growth. Commonly isolated organisms in the descending order of frequency were *Staphylococcus aureus* (43%),*Acinetobacter* (19%), Enterococci (13%), *Klebsiella* (8%),*Pseudomonas aeruginosa* (7%), *Escherichia coli*(5%), Citrobacter (2%),Salmonella (1%),Proteus (1%) and Enterobacter (1%). Resistance to antimicrobials in common use was observed in varying frequency. MRSA was 40% whereas resistance to vancomycin and linezolid was not present. Resistance to ampicillin, ciprofloxacin and vancomycin was observed in 75%,45% and 10% of Enterococcal strains respectively.30% were HLGR whereas all remained susceptible to linezolid. Among the Enterobacteriaceae,production of ESBL,carbapenemase and AmpC were detected in 49%, 26.5% and 5% respectively. Of 51 carbapenemase producers, 11.5% produced MBL. K1 β-lactamase was not produced by any isolates of Enterobacteriaeceae. Co-production of ESBL + carbapenemase was detected in 5% whereas ESBL + AmpC was seen in 0.5%e. 33.4% of Enterobacteriaceae were MDR. Carbapenemase production was detected in 5% of Pseudomonas and 10% of Acinetobacter respectively where as 35% of both were ESBL producers. Overall 17% all gramnegative bacilli were tigecycline resistant.

Conclusion: Both gram positive and gram negative bacteria were responsible for bloodstream infections. Significant degree of antimicrobial resistance with emergence of multiresistance among these isolates over time is a matter of concern. Strengthening of ongoing antimicrobial surveillance system for early detection of resistant isolates is imperative for appropriate selection of antimicrobial therapy and prevention of spread of resistance.

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