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Prevalence of carbapenem resistance genes and corresponding MIC<sub>90</sub> in Enterobacteriaceae at a tertiary care center in Lebanon

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Abstract

Introduction: The aim of this study was to correlate genes involved in carbapenem resistance to MIC levels among clinical ESBL and non-ESBL producing carbapenem resistant Enterobacteriaceae (CRE) isolates of Escherichia coli and Klebsiella pneumoniae.

Methodology: E. coli (n = 76) and K. pneumoniae (n = 54), collected between July 2008 and July 2014, were analyzed. The MICs were determined against ertapenem (ERT), imipenem (IMP) and meropenem (MER). PCR was performed on all 130 isolates to amplify the resistance and outer membrane proteins (OMPs) encoding genes: bla<sub>OXA</sub>-48, bla<sub>NDM</sub>-1, bla<sub>TEM</sub>-1, bla<sub>CTX-M-15</sub>, ompC and ompF. Sequencing was performed on selected isolates.

Results: The prevalence of bla<sub>OXA</sub>-48, bla<sub>NDM</sub>-1, bla<sub>TEM</sub>-1, and/or bla<sub>CTX-M-15</sub> among E. coli isolates were 36%, 12%, 20% and 80%, respectively, while among K. pneumoniae they were 37%, 28%, 28% and 72%, respectively. K. pneumoniae isolates positive for any of these genes had an MIC<sub>90</sub> > 32μg/mL against ERT, IMP and MER, while in E. coli isolates there was a variation in the MIC<sub>90</sub> values. Porin impermeabilities were due to mutations in ompC and ompF genes in E. coli, and loss of ompC and ompF genes in K. pneumoniae, and increased MIC<sub>90</sub> values.

Conclusion: The presence of more than one carbapenem resistance encoding gene and/or ESBL encoding gene did not have an effect on the MIC<sub>90</sub> value in K. pneumoniae isolates, while in E. coli it showed higher MIC<sub>90</sub> values.

Key words: Enterobacteriaceae; CRE; MIC<sub>90</sub>.


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