Introduction

Enterobacteriaceae bacteria, including Acinetobacter baumannii, carbapenem-resistant Enterobacteriaceae (CRE) and Carbapenem-resistant Enterobacteriaceae (CRE) are a major global health threat. The recent emergence of KPC-2, a KPC-producing Klebsiella pneumoniae strain, has been described by the Clinical and Laboratory Standards Institute (CLSI) as a serious problem [1]. Resistance to almost all antibiotics, including carbapenems, in CRE-producing isolates has been reported in several studies [2]. The main resistance mechanism is the production of carbapenemases, which may be plasmid-mediated, chromosomally encoded or acquired from MRSA through horizontal gene transfer [3]. The development of novel agents to treat these bacteria is of great importance.

Materials and Methods

245 Enterobacteriaceae clinical isolates collected in 2014 to 2016 from hospital laboratories in 34 countries were analyzed. Species identification was confirmed, necessary for susceptibility testing. All isolates had a minimum of 94% of the nucleotide sequence of the 16S rRNA gene (16S rRNA). Isolates were tested for susceptibility to carbapenem-resistant Enterobacteriaceae (CRE) using the broth microdilution method as described by the CLSI (Clinical and Laboratory Standards Institute) [4]. CRE isolates were tested against meropenem and vaborbactam. The results of the broth microdilution method were compared with the disc diffusion method according to the EUCAST (European Committee on Antimicrobial Susceptibility Testing) [5]. The minimum inhibitory concentration (MIC) and zone diameter was determined by an expert laboratory. The results were analyzed using the chi-square test.

Results

Among 245 Enterobacteriaceae isolates, 942 (2.8%) were CRE. 60.4% of the CRE isolates were resistance to meropenem alone (MIC >8 µg/mL). A serine carbapenemase, KPC-2, was detected in 17 countries and its prevalence was noted in the United States (55.4%), Germany (53.4%), the United Kingdom (52.1%), Italy (9.3%), Poland (5.6%), and Argentina (5.2%). In total, 22 enterobacteria species were observed in these CRE isolates. Including K. pneumoniae (82.2%), K. oxytoca (12%), and E. coli (5.8%). Phymocystis aeruginosa (11.2%) and P. stuartii (3.8%) were the most active comparators against CRE isolates, followed by meropenem, imipenem, and piperazincillin. For CRE isolates harboring KPC-2, the most active comparators were meropenem, imipenem, and piperazincillin.

Conclusions

The overall prevalence of CRE isolates in the United States was 0.3% of the 2007 human isolates [6]. CRE isolates harboring KPC-2 and other beta-lactamases were recently related to the development of resistance to beta-lactam antibiotics and carbapenems. Isolates with high resistance to meropenem and other carbapenems are highly resistant to effective antimicrobial agents, including carbapenems and other beta-lactam antibiotics. This combination agent will be a useful alternative for the treatment of infections caused by these organisms.

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References