Global Trends in Prevalence and Diversity of Carbapenemases Carrying Enterobacteriaceae Identified through SENTRY Antimicrobial Surveillance Program

LM Deshpande, RE Mendes, CJ Smith, M Castanheira
JMI Laboratories, North Liberty, Iowa, USA

Introduction

Carbapenem-resistant Enterobacteriaceae (CRE) pose a major challenge to treating serious infections caused by these organisms. NS ENT rates vary widely according to geography and are often multidrug resistant, making treatment options a challenge to treating serious infections caused by these organisms. Since 2015, screening has been performed by whole genome sequencing methods and MIC interpretations used current CLSI and EUCAST criteria, as applied to the whole-genome sequences.

Materials and Methods

- Among 112,979 Enterobacteriaceae isolates collected through the longitudinal SENTRY Antimicrobial Surveillance Program from 1997 to 2016:
- These carbapenemases were replaced largely by KPC and NDM carbapenemases worldwide among NS ENT isolates collected through the longitudinal SENTRY Antimicrobial Surveillance Program from 1997 to 2016.
- Prevalence of isolates harboring carbapenemases increased in Europe and Latin America during 2014–16 (33.3% in 2007–09 to 46.5% in 2014–16 in Europe and 32% follow by BSIs (27%) with the majority from bloodstream infections (BSIs; 65.3%).

Results

- Global prevalence of NS ENT isolates increased from 1.5% in 2007–09 to 2.7% in 2014–16 (p<0.001).
- Among 23,078 isolates submitted during 2007–09, 134 (3.3%) were NS ENT with the majority from bloodstream infections (BSIs; 16.3%).
- Isolates from North America had the highest frequency of NS ENT isolates (7.7%) and were followed by isolated in Europe (6.3%) and Asia (3.1%).
- Overall, tigecycline was the only agent that was highly active (>98% S) against CRE isolates from 2015, 1
- The most common carbapenemase was blaKPC-2 (4.9%), followed by blaNDM-1 (1.4%) and blaOXA-48 (1.0%).
- The SENTRY Antimicrobial Surveillance Program supplies a valuable platform for surveillance of these organisms.

Conclusions

- Prevalence of carbapenemases among Enterobacteriaceae is increasing worldwide with changing trends in different geographic regions.
- KPC remains the most prevalent carbapenemase in this collection.
- NDM is currently the most prevalent in the Asia-Pacific region, accounting for more than 50% of the region’s carbapenemases.
- Continued screening for NS ENT and underlying mechanisms to control the spread of these pathogens is warranted.
- The SENTRY Antimicrobial Surveillance Program supplies a valuable platform for surveillance of these organisms.

Acknowledgements

The authors thank all participants of the SENTRY Program for their work in providing bacterial isolates.

References

Clinical and Laboratory Standards Institute (2010). M100-S20: Performance standards for antimicrobial susceptibility testing. 20th informational supplement. Wayne, PA: CLSI.


Koike M, Nakamura K, Nishino T, et al. Increasing prevalence of KPC-producing Enterobacteriaceae in Japan, 1994 and VIM (first identified in Pseudomonas aeruginosa in Italy, 1999) metallo-beta-lactamas were the first carbapenemases to be described in human pathogens.

- Among 40,514 isolates submitted during 2014–16, 1,104 (2.7%) were NS ENT.

Figure 1 Comparative activity of antimicrobial agents when tested against carbapenem-nonsusceptible isolates in the SENTRY Program (2007–2009 and 2014–2016)

Figure 2 Percent prevalence of carbapenemase-genes in the time periods 2007–2009 and 2014–2016