Prevalence of carbapenemase-producing *Klebsiella pneumoniae* during a 4 year period in a tertiary care hospital in Greece

A. Myari[1], C. Gartzonika[1], E. Priavali[1], L. Politi[2], C. Kittas[1], H. Sakkas[1], K. Patras[1], A. Kallinteri[1], A. Tsakris[2], S. Levidiotou[1]

[1]Department of Microbiology, Faculty of Medicine, University of Ioannina, Greece

[2]Department of Microbiology, Faculty of Medicine, University of Athens, Greece

Introduction

Prevalence of carbapenem-resistant *Klebsiella pneumoniae* (CR-KP) strains in Greece tertiary care hospitals has been escalating during the last years. Given the limitations imposed on therapeutic options as well as the serious consequences on patients' outcome originating from CR-KP's multi-drug resistance, close monitoring of their prevalence and their antibiotic resistance patterns is required.

Purpose

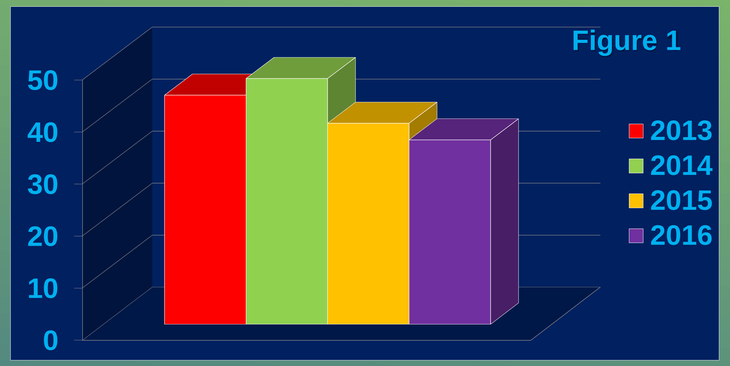
- Determine the prevalence of carbapenemase-producing *Klebsiella pneumoniae* isolated from clinical specimens during the four-year period 2013-2016, at the University Hospital of Ioannina.
- Investigate the resistance genes by molecular methods.
- Study their resistance profile to other antibiotics.

Materials-Methods

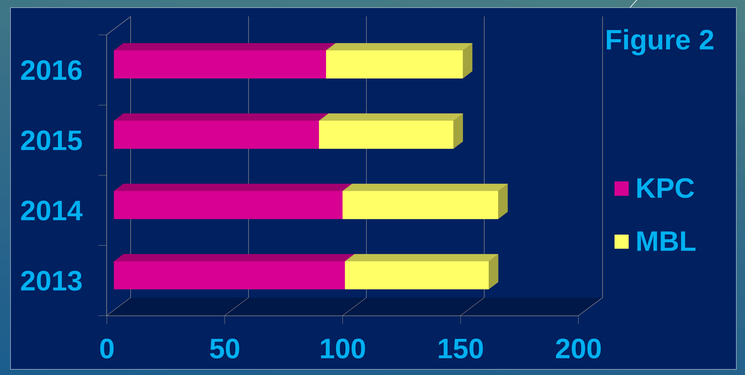
- Species identification and MIC determination were performed using VITEK 2 and E-test (bioMerieux, France).
- Detection of carbapenemase production was performed following phenotypic screening for class A and B carbapenemases, with the combined phenylboronic acid and EDTA zone inhibition enhancement double disk test using meropenem as substrate.
- A significant number of phenotypically detected KPC (*Klebsiella pneumoniae* carbapenemase) and MBL (metallo-β-lactamase) producing strains were assayed by PCR in order to identify genes encoding KPC and MBL carbapenemases and extended spectrum β-lactamases (ESBLs).

Results I

A total of 627 non-repetitive CR-KP clinical isolates were examined for the production of carbapenemases. The average percentage of carbapenem-producing *Klebsiella pneumoniae* (CP-KP) in respect to the total number of KP strains isolated during the 4 year period, is 40.9%. The change of this percentage for each year from 2013 through 2016 is depicted in Figure 1.

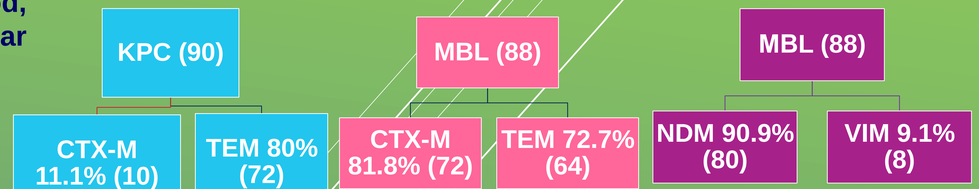


Phenotyping screening detected 63.2% KPC and 36.8% MBL producers.
The frequency of each of CP-KP phenotypes for each year is shown in Figure 2.



Results II

The results from the molecular characterization of 178 CP-KP for bla_{KPC}, bla_{NDM}, bla_{VIM}, bla_{TEM} and bla_{CTX-M} genes, are shown in the charts below:



- Most of MBLs co-harboured bla_{CTX-M} and bla_{TEM} genes.
- None of the CP-KP isolates studied by PCR co-harboured KPC and MBL genes.
- According to the susceptibility testing:
  - ✓ 21.5% (135 out of 627) of CP-KP isolates were found not susceptible to colistin, and only
  - ✓ 1.6% of CP-KP not susceptible to tigecycline

Conclusions

- From the MBLs, bla_{NDM} strains are predominant in our region
- Colistin and tigecycline still have an important place in the treatment of infections caused by carbapenem resistant strains
- As CP-KP infections become wide spread in our region leaving clinicians with limited choices of antibiotics for their treatment, close monitoring of their prevalence and resistance patterns by molecular methods and implementation of effective measures for preventing dissemination in the hospital setting are required.