Detection of multidrug resistant (MDR) Acinetobacter baumannii clonal complex 92 in Iran

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Background: Acinetobacter baumannii is emerging as an important global opportunistic nosocomial pathogen. A. baumannii infection is difficult to treat due to its innate and acquired antimicrobial resistance. The problem is compounded by increasing resistance to broad-spectrum antibiotics (including carbapenems) particularly in developing countries, such as Iran. We study the distribution of bla OXA-type carbapenemases genes by real-time PCR assay among A. baumannii isolated from Tehran hospitals. Pulsed-Field Gel Electrophoresis (PFGE) and Multilocus Sequence Typing (MLST) were conducted for molecular typing of strains. All isolates were confirmed as Acinetobacter baumannii by MALDI-TOF MS and were resistant to both imipenem and meropenem according to EUCAST. The real-time PCR has shown the presence of blaOXA-23-like and blaOXA-51-like genes in twenty and sixteen isolate respectively. PFGE analysis revealed 23 pulsotypes. ST137 / CC92, international clone II (n=2) and ST189 / CC92, international clone II, (n=3) were detected by MLST. The emergence of successful global clones (ST189 and ST137 / CC92) of carbapenem-resistant A. baumannii in Tehran hospitals is concerning.

Material/methods: Twenty-three multidrug-resistant clinical isolates were selected from a collection of A. baumannii samples isolated from different clinical specimens. The strains were sent to Karolinska University Hospital, Stockholm, Sweden, for further characterization. Identification of the isolates was confirmed using matrix-assisted laser desorption/ionisation time-of-flight mass spectrometry (MALDI-TOF MS). The antimicrobial susceptibility testing was carried out with disk diffusion according to EUCAST for 5 antimicrobial agents including gentamicin, imipenem, meropenem, ciprofloxacin and trimethoprim/sulfamethoxazole. Isolates were investigated using real-time PCR amplification and published primers for the presence of the 16S rRNA methylase and blaOXA-carbapenemase genes. Clonal relationships were determined by pulsed-field gel electrophoresis (PFGE) and Multilocus sequence typing (MLST) was done to identify the clusters of selected isolates with ≥ 85 % PFGE.

Results: The isolates were eventually identified as Acinetobacter baumannii by MALDI-TOF MS with high score values. A total of 23 A. baumannii isolates were resistant to both imipenem and meropenem, 22 isolates were resistant to ciprofloxacin, 21 to gentamicin, and 20 to trimethoprim/sulfamethoxazole. Twenty isolates had positive results for blaOXA-23-like and 16 for blaOXA-51-like. Co-expression of blaOXA-23-like and blaOXA-51-like were found in 15 cases. All isolates were negative for all 16S rRNA methylase genes tested. PFGE analysis revealed 23 pulsotypes. Using a ≥ 85 % similarity cut-off, 8 distinct PFGE clades were defined. Identified STs for the respective clades were ST137 / CC92, international clone II (n=2), ST189 / CC92, international clone II, (n=3) and ST337 (n=3).
Conclusions: The bla$_{OXA-23}$ gene was the most frequent carbapenemase identified among resistant A. baumannii isolated in Tehran hospitals. Worldwide clonal complex 92 (CC92) / International clone II A. baumannii represent the most sampled and widespread sequence types.