

High Prevalence of Genes Encoding Main Aminoglycoside-Modifying Enzymes in Isolates of *Staphylococcus aureus* in an ICU in Tehran

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Background & Objectives: *S. aureus* in particular methicillin-resistant *S. aureus* (MRSA) are increasingly important causes of hospital-and community acquired infections throughout the world. Resistance against aminoglycosides (gentamicin and tobramycin), which act synergistically with beta lactams and glycopeptides, among *S. aureus* strains is more important clinically. Aminoglycoside-Modifying Enzymes (AME), AAC (6')-APH(2''), APH(3')-III and ANT(4')-I encoded by the *aac(6')-Ie-aph(2')*, *aph(3')-III* and *ant(4')-I* genes, are involved in this resistance. Despite the high incidence of aminoglycoside resistance to staphylococci, especially among MRSA, there is currently little information on the incidence and types of AMEs in many countries. The aim of the present study is to provide information regarding the prevalence of AMEs among *Staphylococcus isolates* obtained from a hospital in Tehran.

Methods: Between August 2011 to March 2012, 108 *S. aureus* isolates were obtained from clinical and environmental samples of an ICU in Tehran, Iran. The isolates were confirmed by standard bacteriological methods. Testing for susceptibility to the antibiotics was performed using a standard disk-diffusion method according to the CLSI guidelines. All *S. aureus* isolates were examined by PCR for the *aac(6')-Ie-aph(2')*, *aph(3')-III* and *ant(4')-I* genes, using specific primers.

Results: Out of 476(83%) environmental and 96(70.5%) clinical samples, *S. aureus* was detected in a frequency of 80 (17%) and 28 (29.5%), respectively. Methicillin-susceptible Staphylococci were more susceptible to aminoglycoside antibiotics than the methicillin-resistant Staphylococci. More than 90% of MRSA isolates were resistant to kanamycin, tobramycin and gentamicin. The most prevalent gene was *aac(6')-Ie-aph(2')*, had been found in 92.5% of the isolates, followed by *ant(4')-I* and *aph(3')-III*, found in 87% and 81.4% of these isolates, respectively. In this study the concordances between resistance to kanamycin, tobramycin, gentamicin and the presence of [*aac(6')-Ie-aph(2')* and *aph(3')-III*] genes were 65%, and the concordances between [*aac(6')-Ie-aph(2')*, *aph(3')-III* and *ant(4')-I*] genes and resistance to kanamycin, tobramycin, gentamicin were 57%.

Conclusion: Our study shows that periodic hospital surveillance is essential in Iran. In particular, given the alarming rate of aminoglycoside resistance among the MRSA isolates, the surveillance of aminoglycoside resistance strains carrying the AME genes is of crucial importance in Tehran hospital.

Keywords: *Staphylococcus aureus*; AMEs; MRSA; ICU