

Frequency of Fibronectin Binding Protein A and Panton-Valentine Leukocidin in Methicillin-Resistant *Staphylococcus aureus* Collected From Educational Hospitals in Qazvin, Iran

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Abstract

Background: *Staphylococcus aureus* is one of the most important organisms involved in nosocomial infection acquired by patients. In recent years, the appearance of methicillin-resistant *S. aureus* (MRSA) has turned the treatment of these infections into a serious challenge. Surface proteins, such as fibronectin binding proteins (FnBP), and the ability to produce Panton-Valentine leukocidin (PVL) are important factors in pathogenesis of this organism.

Objectives: The purpose of this study was to determine the prevalence of disease-associated genes in the clinical isolates of *S. aureus* encoding FNB and PVL, collected from the educational hospitals of Qazvin, Iran.

Patients and Methods: This was a descriptive, cross-sectional study in which a total of 103 isolates of methicillin-resistant *S. aureus* were collected from hospitalized patients in teaching hospitals of Qazvin, during 2013 - 2014. Initially, the identification of isolates was performed according to the standard laboratory methods, followed by confirming the presence of the *femA* gene, a gene specific to *S. aureus*. Later, the prevalence of virulence genes (*fnb* and *pvl*) was investigated by the PCR method, using specific primers. PCR products were sequenced to confirm the presence of the target genes.

Results: The results of this study showed that among 103 isolates of *S. aureus* resistant to methicillin, 88 isolates were positive for the presence of the *pvl* and *fnb* genes, with the *fnb* gene present in 86 (83.5%) isolates and the *pvl* gene only in 2 (1.9%) isolates.

Conclusions: The results of the present study indicate the presence of the *pvl* and *fnb* genes in the strains of *S. aureus* isolated from clinical specimens collected from the patients admitted to teaching hospitals in Qazvin. Considering the clinical significance of these organisms, and their potential in threatening public health systems, the identification, treatment, and infection control management of patients infected with these organisms is of prime necessity.

Keywords: Panton-Valentine Leukocidin, Fibronectin Binding Protein A, *Staphylococcus aureus*

1. Background

Staphylococcus aureus (*S. aureus*) is a facultative anaerobe, gram-positive coccus and part of the normal flora of the nose, skin, and gastrointestinal tract (1). This organism is one of the most common causes of nosocomial infections worldwide. Recently, the number of staphylococcal infections has been on the rise due to several reasons, including the spread of resistant strains, an increasing number of patients with immune deficiency, and the excessive use of aggressive medical devices such as catheters (2, 3). These organisms are involved in clinically important diseases including scalded skin syndrome, osteomyelitis, urinary tract infections, bacteremia, and toxic shock syndrome (4, 5). Although these bacteria are part of the normal flora of the human body in healthy people, resistance to antibacterial agents can lead to serious infections and even death. Methicillin-resistant *S. aureus* (MRSA) causes a variety of suppurative infections, which are resistant to

antibiotic treatment. These organisms are unaffected by a penicillinase-resistant group of beta-lactam antibiotics (methicillin, nafcillin, and oxacillin) and cephalosporins, leading to redundancy of these antibacterial agents in treating infections caused by organisms (2). The prevalence of MRSA is high in nosocomial infections acquired at patient care centers, particularly in patients with open wounds and patients with immune deficiencies (6). The virulence of *S. aureus* is due to various factors such as surface adhesion molecules. Several studies have shown that surface proteins, such as fibronectin, play a crucial role in invasion of this organism to eukaryotic cells (7). The role and importance of attachment factors in a wide range of diseases caused by *S. aureus* has been studied, and fibronectins have been proven to play a significant role in tissue establishment of these organisms and development of serious diseases, such as keratitis and toxic arthritis, as