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BIOFILM FORMATION AND METALLO β-LACTAMASE PRODUCTION IN CLINICAL AND ENVIRONMENTAL ISOLATES OF *PSEUDOMONAS AERUGINOSA*

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ABSTRACT : In recent years, the worldwide emergence of multidrug-resistant isolates of *Pseudomonas aeruginosa* has been observed. This opportunistic pathogen produces mechanisms of resistance to several antibiotics. The resistance to antibiotic in *P. aeruginosa* isolates has been associated with bacterial biofilm formation and production of metalobetalactmase. Present study undertook to assess antibiotic susceptibility, metalobetalactamase and biofilm formation in clinical and environmental isolates of *P. aeruginosa* that resistant to antibiotics. A total of 586 samples were collected from ICU unit in Hilla Teaching Hospital. *Pseudomonas aeruginosa* isolates were recovered using cetrimide agar base. Kirby-Bauer disc diffusion technique was used for antimicrobial susceptibility testing. Combined disc diffusion technique was used for the detection of MBL production, while we use 96 well flat plate bottoms for detection of biofilm formation. In this study, the most isolates of *P. aeruginosa* were obtained from burns 30(62.5%). In environmental samples, the most isolates were obtained from tools 20 (42.4%). Biofilm formation was observed in clinical sample of the 48 test isolate only 8(16.7%) strong positive in which that formed biofilm weakly positive 6(12.5%). While in the environmental sample of the 48 test isolate only 4(8.3%)strong positive and formed biofilm and 8(16.7%) weakly positive. The result showed that the majority of *P. aeruginosa* isolates were found in burns followed by wounds, urine and sputum samples.While, tools followed by beds, and floors have the major isolates in the environmental samples. The most *P. aeruginosa* isolates displayed multidrug resistance to tested antibiotics as well as a variable activity in biofilmformation as weak positive and strong positive results.

Key words : *Pseudomonas aeruginosa*, antibiotic susceptibility, metallo â-lactamase, biofilm formation.

INTRODUCTION

Pseudomonas aeruginosa is associated with an ever-widening spectrum of infections. Some infections occur predominantly in the community, in healthcare settings especially in the intensive care unit (ICU). Infections may be associated with significant morbidity, mortality and antimicrobial resistance (Kerr *et al*, 2009). The *P. aeruginosa* is the main cause of mortality in cases of bacteremia and the second most common bacterium causing sepsis in the ICU. In addition, it has been implicated in urinary tract infections, burn wounds, ventilator associated pneumonia and multiorgan system failure (Gad *et al*, 2007).

Infections caused by *P. aeruginosa* are difficult to treat, because it has innate resistance to several antibiotics (Heydari and Eftekhar, 2015). Multi-drug resistant *P. aeruginosa* isolates are by definition resistant to at least three antibiotics from the following classes: carbapenems (β-lactams), aminoglycosides and fluoroquinolones. Therefore, the treatment of pseudomonal infections now represents a significant challenge to clinicians and health authorities (Zhao and Hu, 2010). *Pseudomonas aeruginosa* resistance to antibiotic are due to the outer membrane permeability, active efflux pump system, alteration of the penicillin binding proteins and hydrolyzing enzymes. Acquired metalobetalactamase (MBL) have emerged recently as one of the most important mechanism, it was able to hydrolyze almost all the β-lactams as well as carbapenems (Jena *et al*, 2015). Emergence of MBL producing *P. aeruginosa* in intensive care units (ICUs), due to high usage of broad spectrum antibiotics in ICUs. This results in eradication of competitive flora and subsequent selection of multidrug-resistant strains (Kali *et al*, 2013). It was first reported from Japan in 1991, described various parts of the world, including Asia, Europe, Australia, South America and North America. In some countries, *P. aeruginosa* possessing MBLs constitute highly percentage of all nosocomial isolates (Manoharan *et al*, 2010).

Biofilms are dense bacterial communities attached to a solid surface and surrounded by an exopolysaccharide