

Pseudomonas aeruginosa Clinical Isolates: Antibiogram Profile and Biofilm Formation

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ABSTRACT

Background: The gram-negative bacterium, *Pseudomonas aeruginosa* belongs to a vast genus of obligate aerobic, nonfermenting, saprophytes, which are present in water, soil and on plants [1]. Moreover, *P. aeruginosa* can be frequently isolated from tap water. In its natural habitat, this organism is endowed with weak pathogenic potential. However, its profound ability to survive on inert materials, its minimal nutritional requirement, tolerance to a wide variety of physical conditions and relative resistance to several antimicrobial agents and antiseptics, contribute enormously to its ecological success and its role as an effective opportunistic pathogen [2]. *P. aeruginosa* is a notoriously difficult organism to control with antibiotics or disinfectants and has become increasingly recognized as an emerging opportunistic pathogen of clinical relevance.

Multi-drug-resistant *Pseudomonas aeruginosa* (MDRPA) are often isolated from patients suffering from nosocomial infections, particularly those who are admitted to intensive care unit (ICU) [3]. Thus, infections caused by *P. aeruginosa* especially in ICU patients are problematic because the organism apart from being inherently resistant to many drug classes, is able to acquire resistance to many effective antimicrobial drugs and therefore infections caused by *P. aeruginosa* are frequently life threatening and difficult to treat [4,5]. Such multidrug resistance could be due to the slowly growing state of *P. aeruginosa* in the deeper layers of thick biofilms, which the organism has a tendency to form in many in vivo situations [6].

Clinical isolates of *Pseudomonas aeruginosa* often exhibit multidrug resistance due to their inherent ability to form biofilms. Drug resistance in *Pseudomonas aeruginosa* is a major clinical problem, especially in the management of patients with nosocomial infections and those who are under indwelling medical devices. The man objective of this study is to evaluate the biofilm forming abilities of the clinical isolates of *Pseudomonas aeruginosa* and to correlate biofilm formation with multidrug resistance.

Keywords: Pseudomonas aeruginosa; Antibiogram profile; Biofilm; Multi-drug-resistance

METHODS

A total of 90 consecutive isolates of *P. aeruginosa* obtained from various specimens obtained from patients visiting the tertiary care hospital, Pokhara, Nepal between January 2018-October 2018 were studied. Isolates were identified by standard microbiological methods. Antimicrobial sensitivity testing was performed on Mueller-Hinton agar plates with commercially available antibiotic discs (Hi-media, Mumbai, India) using Kirby

Bauer disc diffusion technique [7] and interpreted as per the guidance of CLSI. The antibiotic discs (conc.) used were piperacillin/tazobactum (100/10 mcg), ceftazidime (30 mcg), ciprofloxacin (5 ug), amikacin (30 mcg), imipenem (10 mcg), cefepime (30 mcg), polymyxin B (300 units), gentamicin (10 mcg), and colistin (10 mcg). Pseudomonas aeruginosa strain ATCC 15442 was used as the control. All the isolates were tested for their biofilm forming abilities by employing the tissue culture plate assay nearlier described by Christensen et al. [8].

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RESULTS

Of the 90 Pseudomonas aeruginosa isolates maximum i.e 42 (46.6%) were isolated from patients in the age group of >50 years. Majority (30; 33.3%) of the isolates were obtained from sputum. However, percentage isolation from other specimens like urine, ETT, pus, eye specimens and blood were 18.9%, 16.7%, 16.7%, 7.8% and 6.7% respectively. All the isolates were sensitive to polymixin B and colistin. 91.1% of the organisms were sensitive to imipenem, and more than 80% to aminoglycosides (80% to gentamicin, 83.3% to amikacin). Alarmingly, 73.3% of the organism exhibited resistance against ceftazidime, which is supposed to be the drug of choice against Pseudomonas aeruginosa, often preferred by many clinicians because of its optimum antipseudomonal activity. A total of 29 (32.2%) isolates were biofilm producers. Maximum number of biofilm producing organisms was obtained from ETT (8 of 15; 53.3%), pus (8 of 15; 53.3%) and blood (2 of 6; 33.3%) i.e from all invasive sites. We found multidrug resistance among 32.2% (29/90) of our isolates. Other workers from Nepal reported 18.6% and 20.5% of the Pseudomonas isolates to be multidrug resistant (MDR)[9,10] Yet lower rates of MDR were noted by studies outside Nepal[11] Significantly higher number of biofilm producers (23 of 29; 79.3%) was found to be multidrug resistant as compared to non-biofilm (6 of 61; 9.8%) producers (p=0.000). According to a recent study, biofilm related infective conditions are estimated to be responsible for almost 65% of all nosocomial infections[12] Till date, there are scanty reports in the literature on the discovery and evaluation of any antibiofilm agent which could attenuate the pathogenicity of biofilm forming Pseudomonas aeruginosa.

CONCLUSION

Pseudomonas aeruginosa colonization leading to biofilm formation in deeper tissue and on indwelling devices is a therapeutic challenge.as majority of the isolates would be recalcitrant to commonly used antipseudomonal drugs. Suitable monitoring of drug resistance pattern in all Pseudomonas clinical isolates is a prerequisite for effective patient management.

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