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Incidence Of Carbapenem Resistant *Pseudomonas Aeruginosa* Isolated From Patients With Lower Respiratory Tract Infection In Intesive Care Units.

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Abstract
Carbapenems are used for treating serious infections caused by multidrug resistant gram negative bacilli including non-fermenters (NFGNB). The study documents the occurrence of carbapenem resistance in NFGNB Isolates obtained from patients with respiratory infection in the intensive care units (ICUs). Microbiological work was done of 720 respiratory specimensyielded 690 gram negative bacilli. This included,*Klebsiella* (150), *Enterobactter* (90), *Escherichia Coli* (120), *Proteus Species* (24), *Citrobacter* (20), *Aeromonas* (06), Pseudomonas*aeruginosa* (120) ,*Achromobacter spp*(95), *Acinetobacter spp(65).*This included NFGNB (280) , 46(16.4%) of 280 NFGNB were found to be resistant to imipenem & meropenem. Expectedly, *Pseudomonas aeruginosa* was the predominant NFGNB showing carbapenem resistance in 29 isolates(10.3%), 10 (3.5%) were *Acinetobacter* species and 7 (2.5%) were other NFGNB. 40 of these 46 NFGNB showed resistance to the other antibiotics tested. This study conducted at an Apollo Hospitals inrural region of Chhattisgarh State during January, 2014 to January 2015. The rapid dissemination of carbapenem is therapeutically challenging and necessitates effectiveantibiotics policies and meticulous surveillance program in critical care setting.

Key words: Carbapenem, Pseudomonas Aeruginosa, Non-fermenter gram negative bacilli (NFGNB)

Introduction:

Pseudomonad's are largest group of aerobic, gram negative, non-fermentative bacilli. Some of them produce water soluble pigments which diffuse through the culture medium. The members are mostly saprophytic and widely distributed in soil, water, sewage or wherever decomposing organic matter is found. Carriage of *Pseudomonas aeruginosa* as normal human microbial flora is uncommon. However, in hospitalized and immunocompromised person such a carriage may occur in gastrointestinaltract followed by mist body sites, including throat, nasal mucosa, axillae and perineum (Wilson & Miles, 1975)

Pseudomonas aeruginosa has gained a lot of significance as a nosocomial pathogen. (Kenneth et al 1990).

Carbapenems have revolutionalised the treatment of potentially serious infections caused by multidrug resistant gram negative bacilli (Mendiratta et al., 2005). Stability to

betalactamases had made them the preferred drug of choice in infections with betalactam-resistant gram negative bacteria including non-fermenting bacteria (NFGNB). The

enhanced status of NFGNB as nosocomial pathogens, simultaneous with their increased resistance to carbapenems is immensely worrisome and threatens to disrupt-therapeutic approaches especially among those patients admitted to critical care unit (goossens, 2003).

Objective:

Present study is an attempt to determine magnitude of carbapenem resistance *Pseudomonas aeruginosa* recovered from patients with respiratory tract infections in the intensive care units.

Material and Methods:

The patients admitted to medical and surgical intensive care units at Apollo hospital in Chhattisgarh with the evidence of lower respiratory tract infections were included in the study. A total of 720 respiratory specimens including (endotracheal tube, bronchoalveolar lavage, sputum, chest drain , pleural fluid, Endotracheal secreation) were obtained from patients requiring ventilator support. The study period was from January 2014 to January 2015. The samples were collected, transported and processed in microbiology laboratory and isolates were identified by standard procedure (Colle et al., 1996). Antimicrobial sensitivity testing was performed on Mueller Hinton agar plates with commercially available discs (Hi-Media, Mumbai) by the Kirby - Bauer disc diffusion method. Antibiotic Panel included ampicillin (10□□g), Cefotaxime (30□□□g), Ceftazidimine (30□□g), Cefpirome (30□□g), gentamycin (10□□g), Imipenem (10□□g) Meropenem (10□□g) peperacillin/tazobactum (100/10□□g), aztreonem (30□□g). The results were interpreted as per CLSI recommendation (Performance standards for antimicrobial disk tests, 2006).

Result and Discussion:

Microbiological work – up of 720 respiratory specimens yielded 690 gram negative bacilli. This included,*Klebsiella* (150), *Enterobactter* (90), *Escherichia Coli* (120), *Proteus Species* (24) *Citrobacter* (20), *Aeromonas* (06),*Pseudomonas aeruginosa* (120),*Achromobacter spp* (95), *Acinetobacter spp(65).* This included NFGNB (280), 46(16.4%) of 280 NFGNB were found to be resistant to imipenem & meropenem. Expectedly, *Pseudomonas aeruginosa* was the predominant NFGNB showing carbapenem resistancein 29 isolates (10.3%), 10 (3.5.%) were *Acinetobacter* species and 7 (2.5%) were other NFGNB. 40 of these 46 NFGNB showed resistance to the other antibiotics tested.

In the present study, carbapenem resistance was found to be (16.4%) among 280 NFGNB isolated from ICU patients with clinical evidence of lower respiratory tract infections requiring ventilator support. *Pseudomonas aeruginosa* continues to baffle the clinicians and microbiologist alike due to rapid dissemination of resistance to higher antimicrobials like carbapenem. Prevalence of carbapenem resistance

against *Pseudomonas aeruginosa*in our series was considerably higher than Acinetobacter and other NFGNB. Other documented Indian reports suggest a considerable geographical variation. Taneja etal reported that 34.6% of NFGNB were resistant to imipenem while Gladstone et al and Navneeth et al reported a prevalence of 42.8% and 12% respectively (Taneja et al., 2003; Gladstone et al., 2005 and Navneeth et al., 2002). The relatively low prevalence in our study is no way a reason for satisfaction, since our study was done in a setup catering rural population, in whom carbapenem often are not the first choice drug. Matter of concern is selective multiplication and dissemination of multiple resistant NFGNB in near future. It is pertinent to recognize the nosocomial transmission of resistant NFGNB in intensive care settings and understand the grave consequences it encompasses. Not only does it cause outbreaks in the ICUs, it also prolongs the hospital stay owing to limited therapeutic options, spiraling into financial burden. The spread of resistance to other susceptible bacteria by transmission of genetic material will further worsen the situation.

There are reports in Indian literature indicating considerable morbidity and mortality due to carbapenem resistant NFGNB (Landman et al., 2002). Resistance to carbapenems is due to decreased outer membrane permeability, increased efflux system, alteration of penicillin binding proteins, and the production of carbapenem hydrolyzing enzymes-carbapenemases. The carbapenemases belong to class metallo-□□-lactamases (MBL). The resistance by MBL can be chromosomally encoded or plasmid mediated (Corbella et al., 2002). Carbapenem resistance by MBL threatens to create a piquant situation of cross resistance among related antibiotics, which have been rendered ineffective by ESBL producing resistant strains (Endimiani et al., 2006). Paucity of alternative therapeutic options in carbapenem resistant cases compounds the problem in critically ill patients of ICUs. The situation warrants an immediate implementation of infection control measures, an effective antibiotics policy including antibiotics recycling and stringent antibiotics resistance surveillance measures. The sharingof data and information on carbapenem and antibiotics resistance will be of immense help in devising strategies against bacterial infection of critical care units. In the present study, the detection of carbapenem resistance was done by Kirby-Bauer disc diffusion method. However confirmation of Metallo□□-lactamase production by E-test, Modified Hodgetest, EDTA disc synergy test, other methods is under process as reported elsewhere (Mendiratta et al-2005).

Pseudomonas appears well adapted for proliferation in new millennium. It will continue to increase in medical significance owing to its role in nosocomial infection. Options for control of these organisms require meticulous attention to principles of antisepsis, effective antibiotic policy and stringent surveillance measures. *Pseudomonas aeruginosa* are potentially dangerous in the ICU setting and can lead to increased financial burden for the patients. They may also spread resistance to other susceptible bacteria by horizontal gene transfer. To the best of our knowledge, this is the first report from central India on carbapenem

resistance in *Pseudomonas aeruginosa* from respiratory secretions of patients in the ICUs.

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