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Short Communication

The Threat of New Delhi Metallobetalactamases – A Global Concern

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ABSTRACT

The antibiotic resistance exhibited by the bacterial isolates especially those belonging to the Enterobacteriaceae family is on the rise, which has become one of the great concerns to the world. If the isolated bacteria showed resistance to the commonly used first line drugs, then higher antibiotics were tried in treating the infections caused by them. But nowadays, multidrug resistance is becoming more common. NDM-1 is one of the metallo-beta-lactamases, which is notorious in its ability of making the organism resistant to most of the drugs in use. This mini review article throws light on the characteristics of the NDM-1, treatments and preventive measures.

Keywords: Antibiotics; NDM-1; Multidrug resistance

INTRODUCTION

The rapidly growing antimicrobial resistance in Enterobacteriaceae isolates is a real threat to the world. The dissemination of resistance among the clinically relevant bacteria is a global problem. Many people from various parts of the world visit Asian countries like India for medical conditions because it is comparatively cost effective than in the West. This could be one of the causes of the worldwide spread of NDM-1.

Multidrug resistance among the gram negative bacterial isolates is one of the major concerns to the practicing clinicians. This needs the invention of newer drugs to combat the organisms. The beta lactam drugs were the commonly used drugs against the bacterial infections. However, the beta-lactamase enzymes which are capable of hydrolyzing carbapenem make these drugs ineffective. Carbapenems are a group of drugs active against gram positive, gram negative and anaerobic organisms. Carbapenemases are enzymes found in various clinical isolates. Of them, class B carbapenemases are called MBLs (Metallo beta-lactamases). The most commonly reported MBLs were VIM (Virona Imipenemase) and IMPs.

The recently emerged MBL was named as NDM-1 (New Delhi Metallobetalactamase). NDM is a type of MBL named after New Delhi, city of its origin. NDM was first reported in 2009 in a Swedish patient, travelled to Delhi and got infected with *Klebsiella pneumoniae*. The bacterial isolate was found to be sensitive only to col-

istin and was resistant to all other antibiotics. The first bacteria which carried the MBL was later named as *bla_{NDM}*. *bla_{NDM}* has the ability to make the organism resistant to almost all the beta-lactams. NDM-1 gene is plasmid mediated.

Karthikeyan *et al* in their study, has reported the emergence of this new antibiotic resistance and had briefly discussed its mechanism and epidemiology (Karthikeyan *et al*, 2010). He also reported that 17 out of 29 patients travelled to India from UK had yielded NDM-1 carrying isolates within 1 year. Espinal *et al* has recently identified another enzyme of drug resistance in *Acinetobacter baumannii* and designated it as NDM-2 (Espinal *et al*, 2011). This is considered as a new variant of NDM-1.

NDM -1 has been isolated from various microorganisms like *Escherichia coli*, *Klebsiella pneumoniae*, *Enterobacter cloacae*, *Citrobacter freundii* and *Morganella morganii*. NDM-1 producing bacteria can cause various infections most commonly urinary tract infections. The other infections include septicaemia, wound infections and respiratory tract infections. Symptoms produced may not differ between the bacteria producing NDM-1 and the bacteria that do not. Most of the patients with NDM-1 producing bacterial infections suffer from fever and fatigue. The infections may range from mild to severe. Most of the patients suffering from these infections are at risk of complications (Pittalis *et al*, 2011).

Laboratory diagnosis of NDMs in the clinical isolates is difficult. Carbapenemases are usually resistant to ertapenem, imipenem or meropenem and they show an increased MIC values to these antibiotics. MBL E-test can be used. EDTA – disc synergy test may show inhibition of NDM – 1 by EDTA. Phenotypic detection of NDM-1 is done by Modified Hodge test, which is used for screening of carbapenemase activity (Lee *et al*,

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2001). Molecular methods are used for identification and characterisation of enzymes.

Carbapenems are the drugs used for treating many multidrug resistant gram negative isolates infections and ESBL, Amp C producing isolates (Pitout *et al*, 2008). Hence, Carbapenemase producing strains including NDM-1 producing pathogens are a real threat to the treating practitioners because these infections are most commonly multidrug resistant. Treatment is difficult in most of the patients with NDM-1 producing bacteria (Walsh *et al*, 2010). Ideally, Treatment should be started only after checking the antibiotic susceptibility of the organisms. Clinical laboratories must keep in mind the possibility of multidrug resistance and should check for a wide range of antibiotics including imipenem, meropenem, tigecycline, colistin, azteonam, polymyxin, etc. Combination of antibiotics should be considered when necessary.

CONCLUSION

The rise of NDM-1 is alarming. Antibiotic policies and guidelines need to be followed properly by the treating physicians. The irrational use of various antibiotics and unethical marketing practices of pharmaceutical industries are the major causes of the emergence of multidrug resistant strains. Hence, Microbiologist role has become very important. Doctors should try to implement the policies and guidelines for antibiotic therapy. It is high time, we see to it that antibiotic policies are implemented and followed properly in our place with an aim to reduce the spread of resistant strains.

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