

## Association of Antibiotics Resistance with Efflux Pumps Genes among Multidrug-Resistant *Klebsiella pneumonia* Recovered from Hospital Waste Water Effluents in Eastern Cape, South Africa

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**Abstract :** *Klebsiella pneumoniae* (*K. pneumoniae*) is a significant pathogen responsible for opportunistic and nosocomial infection. One of the most significant antibiotic resistance mechanisms in *K. pneumoniae* isolates is efflux pumps. Our current study identified efflux genes (*AcrAB*, *OqxAB*, *MacAB*, and *TolC*) and regulatory genes (*RamR* and *RarA*) in multidrug-resistant (MDR) *K. pneumoniae* isolated from hospital effluents and investigated their relationship with antibiotic resistance. The sum of 145 *K. pneumoniae* isolates was established by PCR and screened for antibiotic susceptibility. PCR detected efflux pump genes, and their link with antibiotic resistance was statistically examined. However, 120 (83%) of the confirmed isolated were multidrug-resistant, with the largest percentage of resistance to ampicillin (88.3%) and the weakest rate of resistance to imipenem (5.5%). Resistance to the other antibiotics ranged from 11% to 76.6%. Molecular distribution tests show that *AcrA*, *AcrB*, *MacA*, *oqxB* *oqxA*, *TolC*, *MacB* were detected in 96.7%, 85%, 76.7%, 70.8%, 55.8%, 39.1%, and 29.1% respectively. However, 14.3% of the isolates harboured all seven genes screened. Efflux pump system *AcrAB* (83.2%) was the most commonly detected in *K. pneumonia* isolated across all the antibiotics class-tested. In addition, the frequencies of *RamR* and *RarA* were 46.2% and 31.4%, respectively. *AcrAB* and *OqxAB* efflux pump genes were significantly associated with fluoroquinolone, beta-lactam, carbapenem, and tetracycline resistance ( $p < 0.05$ ). The high rate of efflux genes in this study demonstrated that this resistance mechanism is the dominant way in *K. pneumoniae* isolates. Appropriate treatment must be used to reduce and tackle the burden of resistant *Klebsiella pneumonia* in hospital wastewater effluents.

**Keywords :** *Klebsiella pneumonia*, efflux pumps, regulatory genes, multidrug-resistant, hospital, PCR

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