

Editorial

Acinetobacter baumannii Hospital Acquired Infections.

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Over the last decades, *Acinetobacter baumannii* has globally emerged as a highly troublesome nosocomial pathogen, mainly in patients in intensive care units (ICUs). It is most important nosocomial pathogens because of two important characteristics: first, its ability to survive in the hospital environment on animate and inanimate surfaces for long periods with the risk of prolonged endemic infections and second, its resistance to multiple antibiotics including carbapenems- which complicates treatment and to colonize susceptible patients treated with broad-spectrum antibiotic.^{1,2} Multidrug-resistant (MDR) *A. baumannii* strains are associated with infections such as ventilator-associated pneumonia (VAP), septicemia, urinary tract infection, soft skin infection, wound infection, and meningitis, especially in immunocompromised patients in ICU settings.³ The success of *A. baumannii* as an emerging nosocomial pathogen is mostly due to its efficiency in acquiring new antibiotic-resistant determinants.⁴ which may have contributed to the high antibiotic index as classified by the World Health Organization (WHO). The carbapenem-resistant *A. baumannii* is now grouped among the leading causes of bacterial nosocomial infections throughout the world. This special category of pathogens termed as “ESKAPE” consists of *Enterococcus faecium*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, and *Enterobacter spp.*⁵

Clinical significance has been largely driven by a remarkable ability to acquire or upregulate various resistance determinants, making it one of the most successful multidrug-resistant (MDR) organisms threatening current antibiotic therapy.⁶ *A. baumannii* is endowed with multiple mechanisms of survival under a wide range of environments, potentiating capacity for hospital spread.⁷ Among the attributable mortalities in patients with *A. baumannii* healthcare-associated infections, ventilator-associated pneumonia and bloodstream infections are the most common in the intensive care unit (ICU)⁸ with increasing reports of community-acquired *A. baumannii* infections.⁹ Extensively drug-resistant (XDR) and

pandrug-resistant (PDR) isolates of *A. baumannii* is also accumulating in different countries.¹⁰

Treating carbapenem-resistant *A. baumannii* infections is very challenging since they are naturally resistant to antibiotics and therefore associated with poor clinical outcomes. These infections are generally resistant to three or more groups of antibiotic families from quinolones, cephalosporins, β -lactams, aminoglycosides to carbapenems.¹¹ Due to its ability to accept exogenous genetic material and overexpress endogenous resistance genes, it has quickly resulted in the appearance of the MDR phenotype within multiple clonal lineages. In addition to antibiotic resistance, the ability to adhere and produce biofilm on both biotic and abiotic surfaces has been shown to be a virulence factor in many clinical isolates.¹²

The World Health Organization lists the carbapenem resistant *A. baumannii* on the pathogen critical priority list¹³, making it an increasingly growing public health problem worldwide. Multidrug (MDR) resistance among *A. baumannii* strains is driven by rapid gene mutations or transfer of exogenous resistance genes by mobile genetic elements, such as plasmids, transposons or insertion sequences. Resistance to beta-lactam and aminoglycosides is also a rapidly growing public health problem globally. Circulation of carbapenem-resistant *A. baumannii* strains aggravates the antibiotic resistance scenery, making patient’s management challenging.¹⁴ As a result, occurrence of transmission networks associated with MDR in clinical settings has become a growing health issue in different regions of the world.¹⁵

Antibiotic resistance in *A. baumannii* is mediated by enzymatic degradation of antibiotics, mutations/modification of target sites, reduced expression of porins, and overexpression of multidrug efflux pumps.^{16,17} However, resistance to carbapenem is often mediated by β -lactamases including carbapenem-hydrolyzing class D β -lactamases (CHDLs) and metallo- β -lactamases (MBLs). Resistance by class D β -lactamases (CHDLs), also known as oxacillinases, is mainly mediated by the production of carbapenemase enzymes encoded by genes of the *bla_{OXA-23}*, *bla_{OXA-40}*, and *bla_{OXA-58}*-like lineage; however, *bla_{OXA-23}* is reported to be the most prevalent

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worldwide.^{18,19} Transposable elements such as insertion sequences (*ISAbal*) have an important role in carbapenem resistance in *A. baumannii* and are present upstream at promoter regions of the *bla_{OXA-23}*, *bla_{OXA-40}*, *bla_{OXA-58}*, and *bla_{OXA-51}* genes causing overexpression of these resistant genes.²⁰

In Bangladesh 96% *A. baumannii* was detected as MDR. The antimicrobial resistance genes such as *bla_{ampC}* (both chromosomal and plasmid mediated) and carbapenemase genes (*bla_{MBLs}* and *bla_{KPC}*) were observed among 95.83% cephalosporin resistant *A. baumannii*.²¹

According to the Centers for Disease Control and Prevention (CDC) in 2013, (63%) out of 12,000 annual infections in the USA were due to MDR carbapenem-resistant *A. baumannii*, leading to about 500 deaths annually.²² By the late 1990s, carbapenems were the most important antimicrobial drugs of choice by clinicians as they represent the “last-line” drugs for the treatment of infections caused by MDR *A. baumannii* due to their high efficiency and low toxicity.²³

The growing rate of carbapenem resistant *A. baumannii* which continues to be a dangerous nosocomial pathogen. *A. baumannii* has developed three basic properties to perfectly adapt to current healthcare settings: (i) Ability to colonize skin, mucous membranes, and devices and survive in the hospital environment; (ii) ability to express multiple virulence features; and (iii) extensive resistance to antimicrobial agents through enzymatic modification of antibiotics, target gene mutation, altered outer membrane permeability, and upregulated multidrug efflux pumps. Antibiotic policy should be formulated and updated according to the antibiogram results obtained in each hospital. Sensitive antibiotics as tigecycline and colistin should be used judiciously and within the antibiotic policy implemented. Primary caretakers should comply with the implemented antibiotic and infection control policies. This is not only done for the sake of protecting patients, but also for the preventing of the tremendous costs that arises intensely upon infection spread.

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