



Prevalence of Carbapenem-Resistant Enterobacteriaceae in Hospital Settings

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ABOVE THE STUDY

Carbapenem-Resistant Enterobacteriaceae (CRE) have emerged as one of the most formidable threats in modern healthcare, particularly within hospital environments. These organisms, which include common pathogens such as *Escherichia coli* and *Klebsiella pneumoniae*, are resistant to carbapenems often considered antibiotics of last resort for severe bacterial infections. The increasing prevalence of CRE in hospital settings has raised significant concerns due to limited treatment options, high mortality rates, and their potential for rapid dissemination.

Hospitals provide an ideal environment for the emergence and spread of CRE. Factors such as the high density of vulnerable patients, frequent use of invasive devices (e.g., catheters, ventilators), and extensive antibiotic usage contribute to the selection and transmission of resistant organisms. Intensive Care Units (ICUs), in particular, serve as hotspots for CRE infections due to the critical condition of patients and the complexity of care provided. Studies across various regions have reported a steady rise in CRE prevalence, with some healthcare facilities experiencing endemic levels.

The primary mechanism of carbapenem resistance in Enterobacteriaceae is the production of carbapenemase enzymes, which hydrolyze carbapenem antibiotics and render them ineffective. Common carbapenemases include KPC (*Klebsiella pneumoniae* carbapenemase), NDM (New Delhi metallo-beta-lactamase), and OXA-48-like enzymes. These resistance determinants are often encoded on mobile genetic elements such as plasmids, facilitating their rapid spread between bacterial species. This horizontal gene transfer significantly accelerates the dissemination of resistance within hospital microbiota.

In addition to enzymatic degradation, other mechanisms such as porin loss and efflux pump overexpression may contribute to carbapenem resistance. The coexistence of multiple resistance mechanisms within a single organism further complicates treatment and limits therapeutic choices. As a result, infections caused by CRE are often associated with prolonged hospital stays, increased healthcare costs, and poor clinical outcomes.

Surveillance plays a crucial role in understanding the prevalence and distribution of CRE in hospital settings. Routine screening of high-risk patients, particularly those with a history of hospitalization or antibiotic use, can aid in early detection and containment. Microbiological laboratories are increasingly adopting molecular techniques, such as Polymerase Chain Reaction (PCR), to identify carbapenemase genes rapidly and accurately. However, disparities in diagnostic capabilities across healthcare settings may lead to underreporting and hinder effective surveillance.

Infection prevention and control measures are essential to curb the spread of CRE. These include strict adherence to hand hygiene, use of personal protective equipment, environmental cleaning, and isolation of infected or colonized patients. Antimicrobial stewardship programs also play a vital role by promoting the judicious use of antibiotics and minimizing unnecessary exposure to broad-spectrum agents. Education and training of healthcare personnel are equally important to ensure compliance with infection control protocols.

Despite these efforts, managing CRE infections remains a significant challenge. Treatment options are limited and often rely on older, more toxic antibiotics such as colistin, tigecycline, or combination therapies. The development of new antimicrobial agents targeting CRE is ongoing, but their availability and accessibility may be constrained by economic and regulatory factors. Furthermore, the emergence of resistance even to these newer agents underscores the urgency of addressing the problem at its root.

In conclusion, the rising prevalence of carbapenem-resistant Enterobacteriaceae in hospital settings represents a critical public health issue. It reflects the broader challenge of antimicrobial resistance and highlights the need for coordinated efforts in surveillance, infection control, and antibiotic stewardship. Strengthening laboratory capacity, investing in research, and fostering global collaboration are essential steps toward mitigating the impact of CRE and safeguarding the effectiveness of existing antimicrobial therapies.

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