

EXPLAINED

Expert Explains | Why India's drug-resistance problem is bigger than antibiotic overuse

A new ICMR study has linked drug-resistant bacterial infections to higher mortality and greater treatment costs. ICMR's Dr Kamini Walia explains how delayed diagnosis, hospital transmission and antibiotic pressure, among other factors, are fuelling the crisis.



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Antibiotics cannot compensate for failures in infection prevention. (Unsplash)

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A major study of hospitalised patients across India has found that infections caused by antibiotic-resistant “Gram-negative” bacteria are **more likely to be fatal and more expensive to treat** than infections caused by drug-susceptible strains.

Gram-negative bacteria are a group of bacteria that can cause infections in different parts of the body, including the lungs, urinary tract, wounds and bloodstream. They include common hospital pathogens such as *Escherichia coli* (commonly known as ***E. coli***), *Klebsiella pneumoniae*, *Acinetobacter baumannii* and *Pseudomonas aeruginosa*. These bacteria can be particularly difficult to treat when they develop resistance to antibiotics. One important group of antibiotics used for serious infections is carbapenems. When these bacteria become resistant to carbapenems, doctors have fewer effective medicines available to treat patients.

The researchers, part of the Indian Council of Medical Research’s (ICMR) antimicrobial resistance surveillance network, conducted the study across 20 tertiary-care hospitals between April 2022 and April 2025, analysing data from 1,59,336 hospitalised patients.

They compared patients infected with carbapenem-resistant bacteria with those infected by susceptible strains of the same bacteria. “Carbapenem resistance should be regarded as a major threat to patient survival, particularly in severe and bloodstream infections,” says **Dr Kamini Walia**, co-author of study and senior scientist at the Division of Epidemiology and Communicable Diseases, Indian Council of Medical Research (ICMR), New Delhi.

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Your study found that carbapenem resistance was consistently associated with a higher risk of death across all four bacteria. Does this mean that carbapenem resistance has now become a major independent threat to patient survival?

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In our study, mortality was consistently higher among patients with carbapenem-resistant infections across all four major Gram-negative pathogens — *E. coli*, *Klebsiella pneumoniae*, *Acinetobacter baumannii* and *Pseudomonas aeruginosa*. The relative risk of death was 1.16–1.43 across these organisms.

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However, we should be cautious about calling resistance an entirely independent cause of death. Severity of illness, timing of appropriate therapy, source control and other patient factors also influence outcomes. What the study clearly demonstrates is that carbapenem resistance is an important marker of excess mortality and a critical clinical threat that we cannot afford to ignore.

More than 61% of the Gram-negative infections in your study were carbapenem-resistant. How alarmed should we be?

The finding is certainly alarming, but it needs to be interpreted in context. These were tertiary-care hospitals managing referred and often critically ill patients; therefore, the rates should not be interpreted as representative of resistance in the general community or all Indian hospitals.

At the same time, the magnitude of resistance in this hospital population is a warning. The study points particularly towards the importance of healthcare-associated transmission, invasive devices, recent surgery, antibiotic pressure and gaps in infection prevention and timely diagnosis. We should not reduce this to a single problem of antibiotic overuse.

Anti-microbial resistance (AMR) is the result of a complex interaction between antibiotic selection pressure, infection-control practices, transmission within healthcare settings and delayed or inadequate diagnosis.

Mortality from bloodstream infections reached roughly 39-51%. What is going wrong clinically?

Bloodstream infection with a carbapenem-resistant Gram-negative organism is a clinical emergency. In our study, mortality among bloodstream infections ranged from about 39% in resistant *E. coli* to 51% in resistant *A. baumannii*.

There are several reasons why these patients deteriorate: the infection may be recognised late, effective treatment options are limited, resistance may not be identified quickly enough, and critically ill patients may have multiple comorbidities or require invasive devices.

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The two interventions I would emphasise are rapid, accurate diagnostics and prompt delivery of an appropriate antibiotic once resistance is suspected or confirmed. But this must go hand in hand with infection prevention — because preventing a bloodstream infection is always better than trying to rescue a patient after it has occurred.

Treating resistant infections with antibiotics alone costs up to twice as much. Could the true economic cost be several times higher?

Absolutely. The figures in this study are conservative. We deliberately looked only at the cost of antibiotics available under the Jan Aushadhi scheme. We did not include ICU costs, bed and room charges, diagnostic investigations, procedures, supportive care or consultation costs.

The antibiotic cost alone was already 1.1-2 times higher for resistant infections. The real economic burden on patients, families and the healthcare system is therefore likely to be substantially greater.

The antibiotic Ceftazidime-avibactam was used more frequently for resistant E. coli and K. pneumoniae and appeared beneficial in some groups. How much confidence should clinicians place in this finding?

Clinicians should see this as an important signal, not definitive evidence of superiority. Ceftazidime-avibactam was associated with better outcomes in some resistant E. coli and K. pneumoniae infections, including bloodstream infections.

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But this was an observational study. We could not fully adjust for disease severity, timing of appropriate therapy, source control, resistance mechanisms or other factors that influence treatment outcomes. Therefore, these results are better understood as reflecting real-world treatment patterns in India rather than proving that one drug is universally superior to another.

This is precisely why we need better diagnostics and resistance-mechanism information to guide treatment rather than simply escalating to newer and broader antibiotics.

Are Indian hospitals relying too heavily on antibiotics to solve a fundamentally infection-prevention problem?

We need to recognise that antibiotics cannot compensate for failures in infection prevention. More than 85% of bloodstream infections in the study were classified as healthcare-associated, and healthcare-associated infections accounted for a very large proportion of infections caused by these organisms.

Hospitals need to put infection prevention and control at the centre of their AMR response — hand hygiene, device-associated infection prevention, appropriate insertion and early removal of invasive devices, environmental cleaning, surgical infection prevention and surveillance of healthcare-associated infections.

Antimicrobial stewardship is equally important. The answer to rising resistance cannot simply be to use stronger antibiotics; it has to be to prevent infections, diagnose them quickly and use the narrowest effective antibiotic for the shortest appropriate duration.

What needs to happen next — better surveillance, stewardship, diagnostics, new treatments or national policy?

We need all of these, but the priorities should be integrated rather than pursued in isolation.

First, India needs to move from isolate-based AMR surveillance to integrated surveillance that connects laboratory results with patient outcomes, mortality and treatment. Our study demonstrates the value of having this patient-level information.

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Second, we need faster and more accurate diagnostics so that clinicians can distinguish bacterial infection from non-bacterial illness and identify resistance early.

Third, antimicrobial stewardship has to become routine clinical practice—not an optional hospital programme.

Fourth, infection prevention must receive as much attention as antibiotic prescribing, particularly because such a large proportion of these infections are healthcare-

associated.

And finally, we need responsible access to effective newer antimicrobials, coupled with stewardship, so that these drugs remain effective when patients genuinely need them.

The larger message is simple: AMR cannot be solved by discovering another antibiotic every time an old one fails. We have to prevent infections, diagnose them early and preserve the antibiotics we still have.

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