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Hospital-acquired Infections in India: Rising Burden, Systemic Gaps, and Urgent Priorities

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In the low- and middle-income countries (LMICs), Healthcare-associated infections (HAIs) represent a pressing global health threat, where they contribute to prolonged hospital stays, increased mortality, and substantial economic costs.[1] Recent global estimates indicate that 3.2 million patients are affected annually, with a substantially higher burden in LMICs.[2] In India, prevalence rates range from 4.4% to over 13% among hospitalized patients, with even higher rates reported in intensive care units (ICUs).[3] Recent multicentre surveillance data (2025) highlight a persistent rise in HAIs, particularly central line-associated bloodstream infections (CLABSIs), with pooled rates of 8.7-13.9 per 1000 central line-days across adult, paediatric, and neonatal ICUs, which is substantially higher than benchmarks from high-income countries (<1 per 1000 days).[4] These trends, which intensified during the COVID-19 pandemic and persisted thereafter, underscore systemic vulnerabilities compounded by antimicrobial resistance (AMR).

India bears a considerable burden of device-associated infections, including bloodstream infections (BSIs), ventilator-associated pneumonia (VAP), and catheter-associated urinary tract infections (CAUTIs). A large multicentric study conducted between 2017 and 2024 across 54 hospitals and over 200 ICUs documented 8,629 CLABSIs over 977,052 central line-days, with nearly 40% mortality within two weeks among affected patients.[5] Pathogens such as *Klebsiella pneumoniae* and other *Enterobacterales* predominate, with increasing carbapenem resistance. This incidence is particularly higher in neonatal ICUs where infection rates are increased. These infections contribute significantly to disability-adjusted life years (DALYs) in LMICs and are closely linked to widespread and often inappropriate antibiotic use.

Over the past decade, India has made incremental progress in infection prevention and control (IPC). National initiatives such as the National Action Plan on AMR (NAP-

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AMR) 2.0 (2025-2029) emphasize a "One Health" approach integrating surveillance, stewardship, and IPC strategies. Regulatory measures, including the ban on irrational fixed-dose antibiotic combinations and restrictions on colistin use in animal feed, alongside Schedule H1 provisions for antibiotic prescription tracking, represent important steps toward rational antimicrobial use[6]. The Indian Council of Medical Research (ICMR) Antimicrobial Resistance Surveillance Network has expanded its reach, generating valuable data from tertiary care centres. The introduction of infectious disease blocks in district hospitals aims to strengthen diagnostic capacity and reduce infection burden.

Collaborative surveillance networks and multicentre studies have further enabled pooled data analysis and targeted interventions. In larger tertiary centres, implementation of infection control bundles, antimicrobial stewardship programs, and improved diagnostics has resulted in reductions in infection rates to as low as 1-2 per 1000 device-days[7,8]. Advances in microbiological diagnostics, including automated culture systems and molecular techniques, have also facilitated earlier detection and improved clinical management9. Research has identified key risk factors such as prolonged use of invasive devices, prior antimicrobial exposure, and surgical interventions, highlighting the importance of minimizing device duration and optimizing antibiotic use.

Despite these advances, substantial challenges persist. Overcrowding, high patient-to-staff ratios, and inconsistent adherence to IPC practices continue to drive transmission, particularly in public sector and resource-limited settings. Smaller healthcare facilities report alarmingly high CLABSI rates ranging from 15 to 40 per 1000 central line-days, reflecting disparities in infrastructure and capacity10. Shortages of trained infection control personnel, limited access to essential supplies, and inadequate microbiological facilities further hinder effective containment. Neonatal ICUs remain particularly vulnerable, with high infection rates and evolving resistance patterns necessitating tailored protocols.

The rapid emergence of multidrug-resistant organisms has further complicated HAI management. Carbapenem-resistant *Klebsiella pneumoniae, Acinetobacter baumannii*, and other resistant pathogens are increasingly implicated in severe infections, limiting therapeutic options and worsening outcomes[11]. At the same time, formal training in infection prevention, control, and antimicrobial stewardship remains limited, despite growing recognition of these disciplines. Urban-rural disparities in access to advanced diagnostics and care continue to widen, particularly in the context of increasing hospitalization due to non-communicable diseases.

Addressing the rising burden of HAIs in India requires a coordinated and sustained national response. Strengthening surveillance through standardized reporting systems and real-time digital integration is critical for accurate burden estimation and informed policymaking. Scaling up antimicrobial stewardship programs across all levels of healthcare, mandating adherence to infection control bundles, and integrating HAI monitoring into national health programs are essential steps. Expanding access to affordable and quality-assured diagnostics, particularly through the National Essential Diagnostics List, can enhance early detection and guide appropriate therapy.

Equally important is the development of a skilled workforce trained in infection prevention and control. Investments in infrastructure, including isolation facilities, sterilization systems, and supply chains for essential consumables, must be prioritized. Strengthening regulatory frameworks, promoting rational antibiotic use, and fostering public-private partnerships can further support implementation efforts. Additionally, encouraging indigenous research and development of novel antimicrobials and diagnostics will be critical in addressing the growing AMR crisis.

This rising burden of hospital-acquired infections in India reflects a complex interplay of systemic gaps, resource constraints, and antimicrobial resistance. While recent policy initiatives and institutional efforts have laid a strong foundation, significant disparities persist across healthcare settings. Bridging these gaps will require sustained political commitment, increased investment in healthcare infrastructure, and a culture of accountability and adherence to best practices. A comprehensive, multisectoral

strategy integrating surveillance, stewardship, workforce development, and equitable access to care is essential to safeguard patient safety and preserve the effectiveness of antimicrobial therapies for future generations.

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