

*Sameeksha** – Antimicrobial Resistance (AMR)

Key highlights

- People-centred approach to address AMR in human health - core package of interventions to support NAP-AMR
- Updated GLASS manual for AMR surveillance of common bacteria causing human infections
- Initial experience of implementing WHO's Tricycle protocol for integrated surveillance of AMR
- Antibiotic training programmes improves knowledge and attitude of college students
- Role of adult vaccines in antimicrobial stewardship
- Using Xpert Carba-R as a rapid diagnostic tool for predicting carbapenem resistance in ICU patients

Strategic priority 1: Awareness and understanding

The impact of antibiotic resistance training programs on knowledge, attitude, and practice reflection among Indian higher education students

- Reports improvements in knowledge and attitudes, with minor changes in practice scores, following the implementation of an AMR training program targeting undergraduate and post-graduate students.
- Recommended reform of academic curricula, generating awareness among youth and complementing training with experiential initiatives to improve practices.

International Journal of One Health | Research article | 22 September 2023 | [Online link](#)

Awareness regarding antimicrobial resistance and antibiotic prescribing behavior among physicians: results from a nationwide cross-sectional survey in India

- Reveals that physicians demonstrate general awareness of AMR but lack specific knowledge, such as the WHO AWARE classification system, use of antibiograms and the importance of IPC.
- Calls for better education and sensitization of clinicians on AMR.

Antibiotics | Research article | 29 September 2023 | [Online link](#)

Strategic priority 2: Laboratories and surveillance

GLASS manual for antimicrobial resistance surveillance in common bacteria causing human infection

- Updated guidance for countries on methods and metrics for AMR surveillance under GLASS, marking the second phase of its implementation.
- Targets GLASS focal points, public health professionals and health authorities for AMR surveillance, and provides revised approaches for improving surveillance quality and new pathogens, antimicrobials and sites of infection for surveillance.

WHO | Report | 31 August 2023 | [Online link](#)

Global patterns and correlates in the emergence of antimicrobial resistance in humans

- Assesses global AMR emergence data for correlates of AMR emergence.
- Reports that AMR emergence in humans is positively correlated with antibiotic consumption and identifies gaps in surveillance to inform interventions and policies.

Proceedings of the Royal Society of Biological Sciences | Research article | 20 September 2023 | [Online link](#)

Global diversity and antimicrobial resistance of typhoid fever pathogens: insights from a meta-analysis of 13,000 *Salmonella* Typhi genomes

- Global Typhoid Genomics Consortium presents a recent snapshot of global genetic diversity in *Salmonella enterica* serovar Typhi and its AMR determinants.
- Reports high level ciprofloxacin resistance (20%) in South Asia and emergence of a ciprofloxacin-resistant lineage (4.3.1.2.1) in India.

eLife | Research article | 12 September 2023 | [Online link](#)

Age of antibiotic resistance in MDR/XDR clinical pathogen of *Pseudomonas aeruginosa*

- Global spread of multidrug-resistant/extensively drug-resistant *P. aeruginosa* is a public health threat.
- Reports that AMR emergence in humans is positively correlated with antibiotic consumption and identifies gaps in surveillance to inform interventions and policies.

Pharmaceuticals | Research article | 30 August 2023 | [Online link](#)

Bacterial isolates and their antimicrobial susceptibility profile in osteomyelitis patients: an experience from a tertiary care center in a hilly area of Uttarakhand

- Finds *S. aureus* to be the most common isolate in samples from osteomyelitis patients, with 42% MRSA.
- Recommends adequate training and antimicrobial stewardship for targeted therapy.

Cureus | Research article | 28 August 2023 | [Online link](#)

Xpert Carba-R assay on flagged blood culture samples: clinical utility in intensive care unit patients with bacteremia caused by Enterobacteriaceae

- Recommends using Xpert Carba-R as a rapid diagnostic tool for predicting carbapenem resistance in ICU patients with bacteremia caused by Enterobacteriaceae, in conjunction with a rapid identification system.

Indian Journal of Critical Care Medicine | Research article | 31 August 2023 | [Online link](#)

Strategic priority 3: Infection prevention and control

Sameeksha – Infection Prevention and Control | volume 4

- Global Strategy on Infection Prevention and Control
- Multi-country study shows healthcare workers have robust knowledge of healthcare associated infections
- WHO Operational Handbook on IPC for Tuberculosis
- Compendium of strategies for reducing healthcare associated infections
- Online resources for infection prevention and control in haemodialysis settings

WCO India | Publication | 20 October 2023 | [Online link](#)

Strategic priority 4: Optimise use of antimicrobials

The role of adult vaccines as part of antimicrobial stewardship: a scoping review

- Review presents comprehensive supportive evidence of the use of vaccines as part of AMS.
- Four key types of vaccine-related AMS interventions are presented: education, screening, vaccination and monitoring.

Antibiotics | Research article | 10 September 2023 | [Online link](#)

Stewardship 2.0: embracing elements of implementation science to enhance everyday antimicrobial stewardship efforts

- Details the utility of implementation science (IS) in increased uptake and quality improvements in AMS.
- Proposes three methodological approaches to – inform change, IS frameworks to promote change and outcome data to sustain the change.

Antimicrobial Stewardship & Healthcare Epidemiology | Review article | 7 September 2023 | [Online link](#)

Understanding and implementing diagnostic stewardship: a guide for resident physicians in the era of antimicrobial resistance

- Provides an overview of diagnostic stewardship and steps and strategies to help guide early-career physicians.

Microorganisms | Research article | 31 August 2023 | [Online link](#)

Are physicians ready for precision antibiotic prescribing? A qualitative analysis of the acceptance of artificial intelligence-enabled clinical decision support systems in India and Singapore

- In-depth interviews with Indian physicians show scepticism in using AI-enabled tools due to lack of empirical evidence, fear of losing autonomy, and clinical skills and challenges, in contrast to physicians from Singapore.

Journal of Global Antimicrobial Resistance | Research article | 23 September 2023 | [Online link](#)

Interventions to change antimicrobial use in livestock: a scoping review and an impact pathway analysis of what works, how, for whom and why

- Maps research on effective interventions for better antimicrobial use (AMU) in livestock.
- Reports a paucity of impact assessment of AMU interventions in livestock and provides a comprehensive overview of successful interventions including strategies, influential actors, success factors and impact pathways.

Preventive Veterinary Sciences | Review article | 28 September 2023 | [Online link](#)

Strategic priority 5: Research, innovations, and finance

Novel multidrug-resistant sublineages of *Staphylococcus aureus* clonal complex 22 discovered in India

- Whole genome sequencing (WGS) of *S. aureus* from seventeen sentinel sites across India identifies two novel methicillin-resistant *S. aureus* (MRSA) lineages.
- Highlights need to monitor the lineages to inform public health interventions.

mSphere | Research article | 12 September 2023 | [Online link](#)

Gut microbiome perturbation, antibiotic resistance, and *Escherichia coli* strain dynamics associated with international travel: a metagenomic analysis

- Whole metagenomic sequencing of samples from international travellers reveals depletion of microbial diversity, elevated levels of Enterobacteriaceae family and enrichment of antibiotic-resistant genes.
- Suggests pre-travel education, minimising unnecessary antibiotic use during travel, and handwashing as preventive strategies to reduce global spread of AMR.

The Lancet Microbe | Research article | 13 September 2023 | [Online link](#)

Enzyme patterns and factors associated with mortality among patients with carbapenem resistant *Acinetobacter baumannii* (CRAB) bacteremia: real world evidence from a tertiary center in India

- Retrospective observational study reports significant mortality, morbidity, and high rates of aminoglycosides resistance among cases of CRAB bacteremia.
- Highlights the need for more research on efficacy of combination therapies, stewardship programs and generation of local data.

Indian Journal of Critical Care Medicine | Research article | 31 August 2023 | [Online link](#)

When less is more: shortening the Lpp protein leads to increased vancomycin resistance in *Escherichia coli*

- Whole genome shotgun sequencing and comparative genome analysis demonstrates that a 63-nucleotide in-frame deletion of the *lpp* gene increases vancomycin resistance in *E. coli*.

The Journal of Antibiotics | Report | 25 September 2023 | [Online link](#)

Drug-resistant *Helicobacter pylori*: diagnosis and evidence-based approach

- Presents *H. pylori* AMR patterns, mechanisms and clinical implications.
- Identifies current antibiotic susceptibility testing methods and treatment options, highlighting the advancements that enable treatment of *H. pylori* to be included in AMS programs.

Source | Publication type | 14 September 2023 | [Online link](#)

Strategic priority 6: Collaborations

People-centred approach to addressing antimicrobial resistance in human health

- Compiles WHO core package of interventions to support national action plans on AMR.
- Identifies four pillars – prevention of infections; access to essential health services; timely, accurate diagnosis; and appropriate, quality-assured treatment.

WHO | Publication | 19 October 2023 | [Online link](#)

Lessons from a global antimicrobial resistance surveillance network

- WHO developed the extended spectrum β -lactamase (ESBL) *E. coli* Tricycle protocol for integrated AMR surveillance in humans, animals and the environment.
- Outlines the protocol, and the initial implementation experiences and challenges of the Network for Enhancing Tricycle ESBL surveillance efficiency (NETESE).

Bulletin of the WHO | Policy & practice | 6 September 2023 | [Online link](#)

Joining forces against antibiotic resistance: the One Health solution

- Examines microbial and clinical implications of AMR through a One Health lens.
- Highlights the global impact of AMR, linkages between AMR and global health security, and international collaborative strategies required to combat AMR.

Pathogens | Review article | 23 August 2023 | [Online link](#)

Quotable quote

“We as G20 members ...underline the importance of allocating funds to implement AMR National Action Plans from domestic mechanisms and relevant modalities of global financial instruments ...”

– G20 Health Ministers’ Meeting
Gandhinagar, India | August 2023

**Sameeksha* is a Hindi word, meaning review. This compilation of publications and resources (along with a brief summary) aims to review and share information to facilitate containment of antimicrobial resistance in India, grouped according to the strategic priorities of India’s National Action Plan on Antimicrobial Resistance. Kindly note, inclusion of publications and resources in this review/compilation does not imply an endorsement by WHO.