

*Sameeksha** – Antimicrobial Resistance (AMR)

**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.

Key highlights of volume 10

- Raising awareness about antimicrobial resistance in farmers and veterinarians of India
- Estimating the impact of health system factors on AMR in priority pathogens
- Indian network of hospitals for surveillance of healthcare associated infections
- WOA annual report on antimicrobial agents intended for use in animals
- WHO overview and analysis of antibacterial agents in clinical and preclinical development
- Theme for WAAW 2022 is "preventing antimicrobial resistance together"

Strategic priority 1: Awareness and understanding

Comparing the effectiveness of different approaches to raise awareness about antimicrobial resistance in farmers and veterinarians of India

- Compares the approaches to raise AMR awareness among dairy farmers and veterinarians in four Indian states.
- Highlights that dairy farmers should be regularly educated on antibiotic usage and veterinary experts should be provided with tools and strategies to educate farmers on antimicrobial use.

Frontiers | Research article | 16 June 2022 | [Online link](#)

Exploration of primary care clinician attitudes and cognitive characteristics associated with prescribing antibiotics for asymptomatic bacteriuria

- Assesses clinicians' attitudes and characteristics associated with unnecessary antibiotic prescribing for asymptomatic bacteriuria.
- Most primary care clinicians prescribe antibiotics inappropriately for asymptomatic bacteriuria in the absence of risk factors; and clinician characteristics are important for designing antibiotic stewardship interventions.

JAMA Network | Research article | 27 May 2022 | [Online link](#)

Understanding antimicrobial use in subsistence farmers in Chikwawa District Malawi, implications for public awareness campaigns

- Comments on the care and medicine use practices of households dependent on subsistence farming.
- Underscores the importance of addressing AMR through health system strengthening in resource limited settings.

PLoS Global Public Health | Research article | 8 June 2022 | [Online link](#)

Training on GLASS methodology for national surveillance of antimicrobial consumption

- A self-paced course designed to help understand and establish surveillance of the consumption of antimicrobial medicines at country level, based on the WHO standardized methodology for global surveillance of antimicrobial consumption.

WHO | Training material | 13 May 2022 | [Online link](#)

Fight #Antibiotic Resistance with Superheroes Against Superbugs

- A video using an animated “antibiotic capsule” for raising public awareness about antibiotic resistance and antibiotic abuse in society.

Superheroes against Superbugs | Video | 2 June 2022 | [Online link](#)

Drivers and modifiers of antibiotic prescribing and infection prevention & control practices in healthcare settings

- Self-paced training in the form of an interactive video lecture that highlights the behavioural aspects of prevention and control of multidrug-resistant microorganisms.

ECDC | Training resource | 3 May 2022 | [Online link](#)

Strategic priority 2: Laboratories and surveillance

Estimating the impact of health systems factors on antimicrobial resistance in priority pathogens

- Analyses longitudinal AMR data with 633,820 isolates from 70 middle- and high-income countries.
- Showed that immunisation strategies and quality of governance are vital, actionable interventions to reduce AMR.

Journal of Global Antimicrobial Resistance | Research article | 6 May 2022 | [Online link](#)

Seeking patterns of antibiotic resistance in ATLAS, an open, raw MIC database with patient metadata

- Explores the Antimicrobial Testing Leadership and Surveillance database which contains 6.5 million minimum inhibitory concentrations for 3,919 pathogen-antibiotic pairs isolated from 633k patients in 70 countries, between 2004 and 2017.

Nature Communications | Research article | 25 May 2022 | [Online link](#)

Antimicrobial resistance in commensal *Escherichia coli* from humans and chickens in the Mekong Delta of Vietnam is driven by antimicrobial usage and potential cross-species transmission

- Assesses the co-influence of antimicrobial use and AMR transmission in animals and humans in their contact Vietnam.
- Highlights the importance of reducing unnecessary antimicrobial use and limiting interspecies contact by increasing hygiene and biocontainment efforts.

JAC – Antimicrobial Resistance | Research article | 27 May 2022 | [Online link](#)

***Mycoplasma genitalium*: a new superbug**

- Drug resistance to azithromycin and fluoroquinolones in *M. genitalium* is rising globally.
- Reviews the prevalence of *M. genitalium* in different clinical scenarios, molecular mechanisms of pathogenesis, current status of antimicrobial resistance, and its impact on treatment.

Indian Journal of Sexually Transmitted Diseases & AIDS | Review article | 7 June 2022 | [Online link](#)

Emerging antibiotic resistance patterns in a neonatal intensive care unit in Pune, India: a 2-year retrospective study

- AMR patterns in 93 culture-positive (blood/cerebrospinal fluid) infections among neonates admitted in a neonatal intensive care unit.
- High rates of AMR seen in Gram-negative pathogens especially resistance against colistin.
- Routine testing for colistin resistance is needed in view of high resistance levels, in addition to limiting colistin use and infection prevention and control programs.

Frontiers in Paediatrics | Research article | 10 June 2022 | [Online link](#)

Genomic characterization of mobile genetic elements associated with carbapenem resistance of *Acinetobacter baumannii* from India

- Genomic features of some clinical isolates of carbapenem-resistant *A. baumannii* were characterized to understand the role of diverse mobile genetic elements and their genetic context responsible for disseminating carbapenem resistance genes.

Frontiers in Microbiology | Research article | 15 June 2022 | [Online link](#)

The international and intercontinental spread and expansion of antimicrobial-resistant *Salmonella Typhi*: a genomic epidemiology study

- Genomic epidemiology study that investigated the temporal and geographical patterns of emergence and spread of antimicrobial-resistant *S. Typhi* showed a declining trend of multidrug resistant typhoid in South Asia, except in Pakistan.

Lancet Microbe | Research article | 21 June 2022 | [Online link](#)

Antibiotic resistance genes in the gut microbiota of mothers and linked neonates with or without sepsis from low- and middle-income countries

- Gram-negative gut microbiota of mothers and septic/non-septic neonates were characterised in a network of 12 clinical sites across 7 LMICs in Africa and South Asia under the Burden of Antibiotic Resistance in Neonates from Developing Societies (BARNARDS).
- Presence of AMR genes was found to be a predictor of neonatal sepsis and adverse birth outcomes.

Nature | Research article | 4 August 2022 | [Online link](#)

Antimicrobial resistance monitoring of water environments: a framework for standardized methods and quality control

- A framework for standardized methods and quality control for monitoring antimicrobial resistance in water is proposed for environmental AMR monitoring, which is important to provide information for addressing the environmental spread of AMR.

Environmental Science & Technology | Research article | 22 June 2022 | [Online link](#)

Strategic priority 3: Infection prevention and control

Health-care-associated bloodstream and urinary tract infections in a network of hospitals in India: a multicentre, hospital-based, prospective surveillance study

- First standardised HAI surveillance network in India – successful in implementing locally adapted and context-appropriate protocols consistently across 26 tertiary-level hospitals.
- The network identified a large number of healthcare associated blood stream and urinary tract infections with high AMR rates – highlighting the importance of multi-modal approach for HAI prevention and AMR containment strategies.

The Lancet Global Health | Research article | 1 September 2022 | [Online link](#)

Antibiotic manufacturing standard – minimizing risk of developing antibiotic resistance and aquatic ecotoxicity in the environment resulting from the manufacturing of human antibiotics

- Guidance to ensure that antibiotics are made responsibly, helping to minimize the risk of AMR and environmental toxicity, as a step towards responsible antibiotic manufacturing.

AMR Industry Alliance | Private standard | 14 June 2022 | [Online link](#)

Antimicrobial biomaterial on sutures, bandages, and face masks with potential for infection control

- Coating using a combination of *Aloe Vera Barbadensis* Miller, trans-cinnamic acid and iodine encapsulated in a polyvinylpyrrolidone matrix showed excellent antifungal and antibacterial activity in bandages and face masks.
- Such coated bandages may prevent wound and surgical site infections, while coating of disposable facemasks may help in their reuse and waste management.

Polymers | Research article | 10 May 2022 | [Online link](#)

A bottom-up view of antimicrobial resistance transmission in developing countries

- Describes AMR and its transmission in low- and middle-income country settings, highlighting the importance of combining top-down interventions with bottom-up approaches for AMR containment.
- Underscores the importance of regulatory oversight, genomics, and technological innovations in containing AMR.

Nature Microbiology | Research article | 30 May 2022 | [Online link](#)

Transmission of gram-negative antibiotic-resistant bacteria following differing exposure to antibiotic-resistance reservoirs in a rural community: a modelling study for bloodstream infections

- High exposure to reservoirs of gram-negative antibiotic-resistant bacteria (GN-ARB) was associated with greater prevalence of GN-ARB carriage, infections and attributed mortality.
- Highlights the need for early-stage identification and testing capability at community level, where most GN-ARB are likely to be acquired.

Scientific Reports | Research article | 5 August 2022 | [Online link](#)

Effectiveness of interventions to improve drinking water, sanitation, and handwashing with soap on risk of diarrhoeal disease in children in low-income and middle-income settings: a systematic review and meta-analysis

- Provides estimates of the burden of disease attributable to WASH and on the effects of different types of WASH interventions to reduce childhood diarrhoea in low-income and middle-income countries.
- Supports WASH interventions – supplying either water filtered at point of use, higher water quality from an improved source on premises, or basic sanitation services – which reduce childhood diarrhoea.

The Lancet | Research article | 2 July 2022 | [Online link](#)

Strategic priority 4: Optimise use of antimicrobials

Annual report on antimicrobial agents intended for use in animals

- World Organization of Animal Health (WOAH; founded as OIE) annual report highlights the global and regional trends of antimicrobial use in animals.
- Tetracyclines remain the most utilised antimicrobial class globally in animal health, and some antimicrobial classes considered as critically important for use in humans are still used.

World Organization for Animal Health | Report | 26 June 2022 | [Online link](#)

Lack of access to medicine is a major driver of drug resistance. How can pharma take action?

- The market for antibiotics is unstable, with fragile supply chains and tough market conditions.
- This report outlines how these factors limit the development of a robust go-to-market model for such products.

Access to Medicine Foundation | Report | 9 June 2022 | [Online link](#)

Effects of dietary antimicrobial growth promoters on performance parameters and abundance and diversity of broiler chicken gut microbiome and selection of antibiotic resistance genes

- Use of antimicrobial growth promoters in poultry production needs to be reduced and the spread of ARGs in broiler chicken farms needs to be monitored.

Frontiers in Microbiology | Research article | 16 June 2022 | [Online link](#)

Antibiotic stewardship in the era of precision medicine

- Precision medicine is a medical model in which decisions, practices, interventions, and therapies are adapted to the individual patient based on their predicted response or risk of disease.
- Reviews the latest advances in precision medicine relating to antibiotic stewardship, with an emphasis on hospital-based antibiotic stewardship programmes.

JAC Antimicrobial Resistance | Review article | 21 June 2022 | [Online link](#)

Environmental impacts of mass drug administration programs: exposures, risks, and mitigation of antimicrobial resistance

- Reviews current knowledge on antimicrobial compounds, resistant organisms, AMR genes in mass drug administration trials and their environmental impact.

Infectious Diseases of Poverty | Review article | 30 June 2022 | [Online link](#)

Evaluating the antimicrobial use on dairy farms in Chiba Prefecture in Japan using the antimicrobial treatment incidence, an indicator based on Japanese defined daily doses from 2014–2016

- The use of antimicrobial agents in food-producing animals may lead to the emergence and spread of antimicrobial resistance in bacteria of animal origin.
- Antimicrobial use on dairy farms in Japan showed ~84% of antimicrobials were given intramammarily, 13-14% by injection and 1-2% orally.

Journal of Veterinary Medical Science | Research article | 14 July 2022 | [Online link](#)

Strategic priority 5: Research, innovations, and finance

2021 antibacterial agents in clinical and preclinical development: an overview and analysis

- As a part of the WHO's efforts to prioritize and coordinate global research and development efforts to address the discovery void in antibacterial drug development, this report presents an analysis of antibacterial agents in preclinical and clinical development.

WHO | Report | 27 May 2022 | [Online link](#)

A rapid review of environmental health gaps in antimicrobial resistance and water-related research from 1990–2020

- Identifies critical research gaps to develop stewardship plans that equitably address One Health AMR threats.
- Themes related to plant, wildlife, and environmental-related AMR threats were found to be under-prioritized as compared to human and food animal health concerns.

International Journal of Environmental Sciences and Public Health | Research article | 6 June 2022 | [Online link](#)

Antibiotic potentiators against multidrug-resistant bacteria: discovery, development, and clinical relevance

- Reviews the studies relating to the use of antibiotic potentiators for reversal of antibiotic resistance and their potential future use in clinical settings.

Frontiers in Microbiology | Review article | 1 July 2022 | [Online link](#)

Nanomedicine: advancement in healthcare

- Nanotechnology in medicine has revolutionized drug delivery and improved treatment options.
- While they have higher efficacy, bioavailability, dose-response, targeting ability, combat antimicrobial resistance and are safer, the field is often unexplored and limited to academic institutional interests.

Annals of Medicine & Surgery | Letter to Editor | 24 June 2022 | [Online link](#)

Tackling multiple-drug-resistant bacteria with conventional and complex phytochemicals

- Highlights antibiotic resistance mechanisms of bacteria, reversal mechanism of antibiotic resistance by phytochemicals, and the bioactive potential of phytochemicals against multi-drug resistance.

Frontiers in Cellular and Infection Microbiology | Review article | 30 June 2022 | [Online link](#)

Strategic priority 6: Collaborations

Preventing antimicrobial resistance together – Quadripartite theme for WAAW 2022

- The World Antimicrobial Awareness Week (WAAW) 2022 theme “Preventing antimicrobial resistance together” calls for a One Health approach and collaboration across sectors to preserve the efficacy of antimicrobials.

WHO | News | 4 July 2022 | [Online link](#)

Incentivising the development of new antibacterial treatments: progress report

- A joint report for G7 ministers providing an update on the current antibacterial treatment and vaccine pipelines, financial landscape for developing new antimicrobials, and recommendations for future action.

Global AMR R&D Hub and WHO | Report | 16 May 2022 | [Online link](#)

Towards a global One Health index: a potential assessment tool for One Health performance

- Proposes a global One Health index (GOHI) evaluation tool – for scientific measurement of the One Health approach.

Infectious Diseases of Poverty | Research article | 22 May 2022 | [Online link](#)

Understanding the implementation of antimicrobial policies: lessons from the Hong Kong strategy and action plan

- Evaluated the implementation of Hong Kong Strategy and Action Plan on Antimicrobial Resistance 2017–2022.
- Identified areas to focus for future AMR policies – expanding engagement with the public and professionals, creating a collaborative environment for policy implementation, and building a well-functioning monitoring and evaluation system.

Antibiotics | Research article | 10 May 2022 | [Online link](#)

Clinical standards for drug-susceptible pulmonary TB

- The consensus-based clinical standards provide guidance on ‘best practice’ for diagnosis, treatment, and management of drug-susceptible pulmonary TB.

International Journal of Tuberculosis & Lung Disease | Article | 1 July 2022 | [Online link](#)