

*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 3

- World Antimicrobial Awareness week (WAAW) 18–24 November 2021 – *Spread Awareness, Stop Resistance*
- ICMR's Antimicrobial Resistance Research and Surveillance Network – Annual Report 2020
- Impact of COVID-19 on healthcare associated infections
- How to use antibiotics effectively and responsibly in poultry production
- Antimicrobial resistance and water: the risks and costs for economies and societies
- Global Leaders Group's call for reducing the use of antimicrobials in global food systems

Strategic priority 1: Awareness and understanding

World Antimicrobial Awareness Week (WAAW)

- Theme for WAAW 2021 (18–24 November) is – *Spread Awareness, Stop Resistance* and slogan of WAAW continues to be *Antimicrobials: Handle with Care*.
- WAAW 2021 encourages all stakeholders, including policymakers, health care providers, and the general public to recognize that everyone can be an Antimicrobial Resistance (AMR) Awareness champion.

WHO | News | 26 August 2021 | [Online link](#)

Crowdsourcing to develop open-access learning resources on antimicrobial resistance

- Crowdsourcing challenge contests were used to identify infectious disease teaching materials.
- This approach can be adapted by teachers to develop additional teaching resources on AMR.

BMC-ID | Research article | 6 September 2021 | [Online link](#)

Antimicrobial stewardship: assessment of knowledge, awareness of AMR and appropriate antibiotic use among healthcare students in a Nigerian university

- Majority of students were aware that antimicrobial resistance makes it harder to eliminate the infection from the body as existing drugs become less effective and had used antibiotics in the past 12 months.
- Authors suggest educational interventions like seminars/symposia or workshops starting at early years of study to improve the knowledge and understanding of AMR among healthcare students to optimise rational antimicrobial use and curb AMR.

BMC-ME | Research article | 10 September 2021 | [Online link](#)

Educational resource review: antimicrobial stewardship in veterinary practice

- This [massive open online course \(MOOC\)](#) on veterinary antimicrobial stewardship presents key themes via a variety of engaging mediums which confer a deeper understanding of important concepts relating to antimicrobial stewardship
- Provides actionable steps for veterinarians which could be introduced into their practice.

JAC-AMR | Article | 3 September 2021 | [Online link](#)

A kiosk survey of perception, attitudes and knowledge of Australians concerning microbes, antibiotics, probiotics and hygiene

- A kiosk-based survey of visitors at the American Museum of Natural History (AMNH) showed poor understanding of the role of microbes in everyday life among Australians.
- The aim of this study is to stimulate a better roadmap for public education about microbes, antibiotics, probiotics and hygiene.

HPJA | Long research article | 10 August 2021 | [Online link](#)

Strategic priority 2: Laboratories and surveillance

ICMR's Antimicrobial Resistance Research and Surveillance Network – Annual Report 2020

- Compiles AMR data on six pathogen groups from ICMR's network of thirty tertiary care hospitals/laboratories across the country.
- *Escherichia coli* was the commonest amongst 65,561 culture positive isolates.
- Includes AMR profile of secondary bacterial infections from COVID-19 patients.
- Classifies difficult to treat drug resistant pathogens into 3 groups based on their morbidity, mortality and response needed for their containment.

ICMR | Annual Report | September 2021 | [Online link](#)

Twenty-year trends in antimicrobial resistance from aquaculture and fisheries in Asia

- Systematic review and meta-analysis of 749 point prevalence surveys reporting antibiotic-resistant bacteria from aquatic food animals in Asia (including India), extracted from 343 articles published in 2000-2019.
- Concerning levels of resistance to medically important antimicrobials was found in food borne pathogens.
- Interventions needed to mitigate the global impact of AMR, are scaling up surveillance to strengthen epidemiological evidence on AMR and informing aquaculture and fisheries.

Nature Communications | Article | 10 September 2021 | [Online link](#)

Whole-genome sequence-informed MALDI-TOF MS diagnostics reveal importance of *Klebsiella oxytoca* group in invasive infections: a retrospective clinical study

- Researchers analysed whole-genome sequence data of a diverse selection of *Klebsiella* spp. isolates from 8 hospitals in 4 countries and identified resistance and virulence factors.
- *Klebsiella* groups and species differed in AMR profiles and in their association with invasive infection
- Highlights the importance of species identification to enable effective treatment options.

Genome Medicine | Research | 13 September 2021 | [Online link](#)

Antimicrobial activity of ceftazidime/avibactam, ceftolozane/tazobactam and comparator agents against *Pseudomonas aeruginosa* from cystic fibrosis patients

- Antimicrobial susceptibility patterns of 273 *Pseudomonas aeruginosa* isolates from 39 hospitals worldwide (17 countries) were tested by reference broth microdilution method.
- Higher susceptibility rates for ceftazidime/avibactam compared with ceftolozane/tazobactam were observed among the resistant isolates from patients of cystic fibrosis.

JAC-AMR | Article | 4 September 2021 | [Online link](#)

Development and clinical evaluation of a new multiplex PCR assay for a simultaneous diagnosis of tuberculous and nontuberculous mycobacteria

- A new multiplex MTB/NTM assay was evaluated that can differentiate *M. tuberculosis* complex (MTBC) from all non-tuberculous mycobacteria (NTM), including the most common NTM, *M. avium* complex (MAC).
- The new multiplex assay demonstrated better specificity and could complement the widely used Xpert assay for better discrimination of TB and NTM infections.

EBioMedicine | Research Paper | 10 August 2021 | [Online link](#)

Strategic priority 3: Infection prevention and control

The impact of COVID-19 on healthcare-associated infections

- The rates of hospital-onset bloodstream infections and multidrug resistant organisms, including MRSA, vancomycin-resistant enterococcus and Gram-negative organisms were each significantly associated with COVID-19 surges as per the microbiology data from 81 hospitals.
- Emphasizes the need for routine hospital infection prevention while balancing COVID-related demands.

CID | Accepted Manuscript | 9 August 2021 | [Online link](#)

Green ministry drops antibiotic effluent limits from new rules

- In January 2020, the Union Environment ministry developed the draft Environment (Protection) Rules for manufacturing bulk drugs which listed antibiotic residue effluent limits for 121 types of antibiotics.
- Recent notification issued on 6 August 2021 dropped limits for antibiotic residues/effluents for bulk drug formulation/pharmaceutical industry, since most developed nations did not have similar standards or limits on antibiotic residue effluents.

The ET | News | 13 August 2021 | [Online link](#)

Strategic priority 4: Optimise use of antimicrobials

How to use antibiotics effectively and responsibly in poultry production – for the sake of human and animal health

- Provides key messages on AMR for the poultry stakeholders, focussing on good husbandry practices, biosecurity, vaccinations, etc to reduce the need for antibiotics in poultry production.
- Advises not to use antibiotics for disease prevention or as a feed additive, and only use them when a veterinarian has diagnosed a disease and treat only infected birds.

FAO | Publication | July 2021 | [Online link](#)

Progress towards antibiotic use targets in eight high-income countries

- Compares sale of antibiotics using 2019 WHO AWaRe classification and target of 60% consumption of 'Access' antibiotics in eight high-income countries – France, Germany, Italy, Japan, Spain, Switzerland, UK and USA.
- This study identifies changes to prescribing that could allow countries to achieve the WHO target.

WHO Bulletin | Research | August 2021 | [Online link](#)

Mapping the antimicrobial supply chain in Bangladesh: a scoping-review-based ecological assessment approach

- Proposes a new framework for antimicrobial medicines supply chain mapping using 16 indicators, which can be applied to other low- and middle-income countries to rapidly assess supply chain gaps and to identify areas for targeted interventions on access and use of antimicrobials.
- Could be used by regulators to map/identify geographical regions with high pharmacy densities for more targeted inspections for medicines quality assurance.

GHSP | Original Article | 24 August 2021 | [Online link](#)

Prevalence and determinants of inappropriate antibiotic dispensing at private drug retail outlets in urban and rural areas of Indonesia: a mixed methods study

- This cross-sectional survey showed that widespread inappropriate dispensing of antibiotics by private drug retail outlets.
- Interviews revealed that inappropriate antibiotic dispensing was driven by strong patient demand for antibiotics, unqualified drug sellers dispensing medicines, competition between different types of drug outlets, drug outlet owners pushing their staff to sell medicines, and weak enforcement of regulations.
- Proposes a multifaceted intervention approach to reduce inappropriate use of antibiotics.

BMJ-GH | Original Research | 3 August 2021 | [Online link](#)

Epidemiology and antimicrobial resistance profiles of Salmonella in chickens, sewage, and workers of broiler farms in selected areas of Bangladesh

- This cross-sectional study showed overall Salmonella prevalence of 66%, with high antimicrobial resistances to colistin, doxycycline, ciprofloxacin and ceftazidime along with high percentage of multidrug-resistance.
- An integrated approach is needed to limit further spread of AMR especially of drug-resistant Salmonella at the animal-human-environment interface.

JIDC | Original article | 31 August 2021 | [Online link](#)

A national survey of antibacterial consumption in Sri Lanka

- This study quantified national antibacterial consumption among public and private sector in Sri Lanka using all available sources, based on WHO methodology for surveillance of antimicrobial consumption.
- Antimicrobials were grouped using the Anatomical Therapeutic Chemical (ATC) classification and converted to Defined Daily Doses (DDDs).
- This national consumption survey highlights the need for establishment of antibacterial consumption surveillance as higher use of broad spectrum and Watch category antibacterials was observed in the private sector.

PLoS ONE | Research Article | 14 September 2021 | [Online link](#)

Seven *versus* 14-days course of antibiotics for the treatment of bloodstream infections by Enterobacterales: a randomized, controlled trial

- The results of this open-labelled, multicentric, randomized, controlled trial show that 7-day courses of antibiotics for treating bacteraemic infections produced by Enterobacteriaceae achieved similar outcomes to the 14 days treatment
- The reduced exposure of patients to antibiotics due to the shorter treatment may be preferred, as long as the source of infection is controlled.

CMI | Full length article | 9 September 2021 | [Online link](#)

Comparison of antibiotics included in national essential medicines lists of 138 countries using the WHO AWaRe classification: a cross-sectional study

- Compared the listing of antibiotics in national essential medicines lists (NEMs) for 138 countries to those in the 2019 WHO Model List and the AWaRe classification database to determine the degree to which NEMs are in alignment with the AWaRe classification framework recommended by WHO.
- The findings emphasize potential changes to antibiotics included in NEMs that would increase adherence to international guidance for effectively treating infectious diseases while addressing AMR.

The Lancet ID | Article | 29 July 2021 | [Online link](#)

Strategic priority 5: Research and innovations

Antimicrobial resistance and water: the risks and costs for economies and societies

- AMR from water pollution has grown into a major global health concern, since water is a primary vector in the spread of AMR and AMR diseases in countries lacking universal wastewater treatment and access to clean water and sanitation.
- Water access and pollution control can have a pivotal effect on AMR development and outcomes.

WEF | Briefing paper | August 2021 | [Online link](#)

Surviving Sepsis Campaign: research opportunities for infection and blood purification therapies

- Surviving Sepsis Campaign research committee published 26 priorities to reduce sepsis and septic shock.
- This study aimed to address six questions in order to provide current evidence and highlight areas of uncertainty and future directions.

CCE | Review article | 7 September 2021 | [Online link](#)

Oral microbiota of wild bears in Sweden reflects the history of antibiotic use by humans

- AMR can be exchanged between humans, livestock, and wildlife, and wild animals can be used to monitor human-associated AMR.
- The study demonstrated a significant decrease in total AMR load in bears in the last two decades, coinciding with implementation of Swedish strategies to curb AMR.
- Reiterates that public health policies can be effective in limiting human-associated AMR contamination of the environment and wildlife.

Current Biology | Report | 25 August 2021 | [Online link](#)

Longitudinal study on the effects of growth-promoting and therapeutic antibiotics on the dynamics of chicken cloacal and litter microbiomes and resistomes

- This study assessed AMR in animal husbandry facilities by complementing metagenomic approaches with culture-based analyses that specifically targeted AMR in priority pathogens.
- Recommends regulation for use of bacitracin and enrofloxacin in poultry production.
- Proposes routine surveillance of EBSL-*E. coli*; vancomycin resistant enterococci (VRE) and fluoroquinolone resistant *C. jejuni* in poultry and to monitor their spread in the environment.

Microbiome | Article | 28 August 2021 | [Online link](#)

Strategic priority 6: Collaborations

World leaders and experts call for significant reduction in the use of antimicrobial drugs in global food systems

- The Global Leaders Group's statement calls for bold action from all countries and leaders across sectors to tackle AMR.
- A top priority – call to action – is to use antimicrobial drugs more responsibly in food systems and markedly reduce use of antimicrobials that are of greatest importance to treat diseases in humans, animals and plants.

WHO | News | 24 August 2021 | [Online link](#)

Regional consultation on the WHO Policy Guidance on Integrated Antimicrobial Stewardship Activities in human health

- Combined report of the meetings organized for Latin American and Caribbean countries to ensure wide dissemination and adaptation of the WHO policy guidance on integrated antimicrobial stewardship.

PAHO | Final Report | 25 August 2021 | [Online link](#)