

*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 4

- IDSA survey amongst infectious disease providers knowledge of and engagement in quality improvement
- Complexities in the uptake of indigenously developed rapid point-of-care diagnostics for AMR containment
- Sepsis quality improvement – recognition and management; recommended minimum standards
- Implementation of One Health approach in India to stop easy access to antibiotics and spread of AMR
- WHO costing and budgeting tool for national action plans on antimicrobial resistance
- Roadmap for adapting/implementing WHO policy guidance on integrated antimicrobial stewardship in health

Strategic priority 1: Awareness and understanding

Infectious disease providers' knowledge of and engagement in quality improvement

- Web-based IDSA survey amongst infectious disease providers on quality improvement had poor participation rate suggesting a lack of engagement with gaps in knowledge and measurement systems.
- Measures to close the gaps on limiting barriers like cost, lack of time, data collection resources, and an ID-specific registry will benefit infectious disease management in a value-driven healthcare economy.

OFID | Article | 8 October 2021 | [Online link](#)

Pharmacists' and nurses' role in antimicrobial stewardship, antimicrobial resistance, and sepsis care

- Aligns antimicrobial stewardship with sepsis care and links to quality education resources.
- Educational opportunities combined with peer support will help integrate contributions of pharmacists and nurses in antimicrobial stewardship, AMR, and sepsis care.

ISMP | Featured article | 23 September 2021 | [Online link](#)

Understanding antibiotic usage on small-scale dairy farms in the Indian states of Assam and Haryana using a mixed-methods approach – outcomes and challenges

- Only 10% of farmers surveyed confirmed using antibiotics in their dairy herds and only 8% had milk samples positive for antibiotic residues of novobiocin, macrolides, and sulphonamides.
- Highlights lack of understanding of antibiotics among small-scale dairy farmers.

Antibiotics | Article | 18 September 2021 | [Online link](#)

Strategic priority 2: Laboratories and surveillance

Understanding complexities in the uptake of indigenously developed rapid point-of-care diagnostics for containment of antimicrobial resistance in India

- Augments India's development and deployment of diagnostics in Indian health care system, with emphasis on the need to translate ready to use indigenously developed AMR diagnostic products.
- Proposes a three-step approach for providing a seamless pathway to expedite the availability of the AMR diagnostics in the healthcare system.

BMJ Global health | Article | 27 September 2021 | [Online link](#)

Outbreak of ceftriaxone-resistant *Salmonella enterica* serotype Typhi – Tiruchirappalli, Tamil Nadu, India, June 2018

- First reported outbreak of laboratory-confirmed ceftriaxone-resistant *S. Typhi* identified through India's National AMR laboratory surveillance network after in-depth epidemiological investigation.
- Timely and detailed outbreak investigations and enhanced surveillance in detecting emerging pathogens should be consolidated along with strengthening of knowledge on food safety.

JIID Regions | Original Article | 4 October 2021 | [Online link](#)

Interplay between phenotypic resistance to relevant antibiotics in Gram-negative urinary pathogens: a data-driven analysis of 10 years' worth of antibiogram data

- Secondary analysis of taxonomic and resistance data corresponding to urinary tract infections.
- Suggests standardized collection of phenotypic resistance data and the introduction of big data analytic methods in low-resource settings as a viable alternative for molecular surveillance for AMR.

Life | Communication | 8 October 2021 | [Online link](#)

Current state of *Salmonella*, *Campylobacter* and *Listeria* in the food chain across the Arab countries: a descriptive review

- Detection of non-typhoidal *Salmonella*, *Campylobacter* and *L. monocytogenes* in foods of animal origins is a significant challenge to food safety and public health due to the emergence of multidrug-resistant strains.
- Recommends establishment of coordinated surveillance and monitoring system for foodborne pathogens to design informed control and prevention strategies at national and regional levels.

Foods | Review | 5 October 2021 | [Online link](#)

Occurrence of multi-drug-resistant *Escherichia coli* in chickens, humans, rodents and household soil in Karatu, northern Tanzania

- Among 960 samples from chickens, humans, rodents and soil, *E. coli* was frequently isolated with 78% of those isolates being multidrug-resistant.
- Reinforces the need for comprehensive interventions using a One Health approach for improving awareness of the community on judicious use of antimicrobial agents in humans and animals, house conditions and waste management and rodent control measures.

Antibiotics | Article | 21 September 2021 | [Online link](#)

Potential sources and characteristic occurrence of mobile colistin resistance (mcr) gene-harboured bacteria recovered from the poultry sector: a literature synthesis specific to high-income countries

- Rampant and unrestricted dissemination of colistin resistance genes in the poultry sector is threatening the clinical use of colistin which is a last-resort antibiotic used for treating deadly human infections.
- Efforts to curtail colistin resistance with One Health approach enhanced by the implementation of effective antimicrobial stewardship and use of antibiotic alternatives such as probiotics and antimicrobial peptides are needed.

PeerJ | Review | 5 October 2021 | [Online link](#)

Increased incidence of invasive *Haemophilus influenzae* disease driven by non-type B isolates in Ontario, Canada, 2014 to 2018

- Summarizes the epidemiology of invasive *H. influenzae* along with serotype-dependent trends in antimicrobial susceptibility.
- *H. influenzae* is a high-priority antimicrobial-resistant pathogen, therefore, global understanding of its epidemiology is required to support appropriate antibiotic stewardship and further vaccine planning initiatives.

ASM | Research Article | 6 October 2021 | [Online link](#)

Strategic priority 3: Infection prevention and control

Sepsis quality improvement – recognition and management; recommended minimum standard for the Asia Pacific region

- The Asia Pacific Sepsis Alliance (APSA) supports clinicians and health services for effective quality improvement process in the Asia Pacific region regardless of income status.
- Outlines minimum quality standards to ensure high quality practice in sepsis recognition, clinical care and support for optimal recovery.

APSA | Position Statement | September 2021 | [Online link](#)

Beyond the operating room: do hospital characteristics have an impact on surgical site infections after colorectal surgery? a systematic review

- Reviews SSI rate after colorectal surgery, whether superficial incisional, deep incisional or organ/space.
- Emphasizes the need for further studies addressing the variables and confounding effect of patient case mix reviews.

BMC | Review | 30 September 2021 | [Online link](#)

Effectiveness of chlorhexidine in preventing infections among patients undergoing cardiac surgeries: a meta-analysis and systematic review

- Examines the impact of chlorhexidine on infections after cardiac surgery specifically compared with other cleansers or antiseptics.
- Concludes that chlorhexidine does not protect against surgical site infections, deep wound infection, and urinary tract infections but might protect against superficial surgical site infections, bloodstream infection, nosocomial infections, and pneumonia.

BMC | Review | 7 October 2021 | [Online link](#)

Strategic priority 4: Optimise use of antimicrobials

Easy access to antibiotics; spread of antimicrobial resistance and implementation of One Health approach in India

- Review attempts to delineate the influence of antibiotics abuse on the human, animal and environmental health under the realm of One Health.
- Reiterates efforts by government policy makers to reduce the burden of AMR in the country and suggests parallel efforts in educating healthcare professionals, strict legislation for pharmacies and pharmaceutical companies along with surveillance of newly emerged AMR pathogens and prioritising AMR research.

JEGH | Review article | 28 September 2021 | [Online link](#)

Assessing the impact of the global point prevalence survey of antimicrobial consumption and resistance (Global-PPS) on hospital antimicrobial stewardship programmes: results of a worldwide survey

- AMS implementation varied across regions ranging from 10.8% in Africa to 60.9% in Northern America but learning needs of hospitals in high-income countries and in low-and middle-income countries were similar.
- Global-PPS is useful in informing stewardship activities and further development of a set of dedicated educational resources and locally-tailored AMS interventions thus contributing to a sustained response to AMR in participating hospitals.

ARIC | Research article | 28 September 2021 | [Online link](#)

Over-the-counter sale of antibiotics in India: a qualitative study of providers' perspectives across two states

- Qualitative study showing poor knowledge of respondents regarding AMR in Haryana and Telangana.
- Main drivers for over the counter dispensing of antibiotics as suggested by pharmacists were commercial interests, poor access to public healthcare, economic and time constraints among consumers, lack of stringent regulations, and scanty inspections.
- Recommends comprehensive strategy aligned with the NAP-AMR to curb the inappropriate use of antibiotics.

Antibiotics | Article | 17 September 2021 | [Online link](#)

Antibiotic consumption and its relationship with bacterial resistance profiles in ESKAPE pathogens in a Peruvian hospital

- ESKAPE pathogens resistance profiles showed a high level of resistance to many antibiotics. Positive correlation is found between the consumption of ceftazidime and the resistance to meropenem in *Pseudomonas aeruginosa*, and between ciprofloxacin usage and *Enterobacter* spp. resistance to piperacillin/tazobactam.
- Findings reinforce the need for continuous assessment of antimicrobial stewardship strategies, including microbiological indicators and antimicrobial consumption patterns.

Antibiotics | Article | 8 October 2021 | [Online link](#)

Assessment of antibiotic stewardship components of certification programs in US animal agriculture using the antibiotic stewardship assessment tool

- Evaluation identified as area with the most opportunities for enhancing and promoting ASP implementation on farms as it ensures accountability for following recommended antibiotic stewardship guidelines.

FSFS | Research Article | 20 September 2021 | [Online link](#)

FDA-TRACK: progress on FDA's support of antimicrobial stewardship in veterinary settings

- Accomplishment measures aligned with three overarching goals in Center for Veterinary Medicine's plan focusing on next steps of implementation with aim to slow the emergence of resistance arising from the use of antibiotics in animals, while ensuring availability of safe and effective antibiotics for use in animals and humans.

FDA | News | 14 September 2021 | [Online link](#)

Strategic priority 5: Research, innovations and finance

WHO costing and budgeting tool for national action plans on antimicrobial resistance

- Considers different country contexts and can be used to calculate and visualize detailed costs for prioritized activities included in the NAPs on AMR, and these plans can then be consolidated into one national costed plan.

WHO | Tool, checklist and guide | 13 October 2021 | [Online link](#)

The Lancet Commission on diagnostics: transforming access to diagnostics

- Comprehensive analysis of the current global status of diagnostics with the use of the six WHO building blocks of health systems making an economic case for investment in sustained access to quality, affordable diagnostics.
- Diagnostics are central and fundamental to quality healthcare. Innovations within the past 15 years in many areas like financing, technology, and workforce can reduce the diagnostic gap, improve access, and democratise diagnostics to empower patients.

The Lancet | Review | 5 October 2021 | [Online link](#)

An economic lens to understanding antimicrobial resistance: disruptive cases to livestock and wastewater management in Australia

- Illustrates economic perspective in understanding the potential risks surrounding AMR and identifies the net welfare associated with specific interventions.
- Offers a way forward through cost-effective policy options considering the impacts of AMR in the context of livestock and wastewater use in Australia and when quantifying the potential disruption to the economy

AARES | Special Issue | 08 October 2021 | [Online link](#)

CARB-X 2020-21 annual report: CARB-X surpasses all goals in first five years in combatting antibiotic resistant-bacteria

- Combating Antibiotic-Resistant Bacteria Biopharmaceutical Accelerator (CARB-X) is a global non-profit partnership dedicated to accelerating early development of antibacterial R&D by integrating therapeutics, diagnostics and prevention.
- At global scale, since inception, CARB-X is involved with 92 projects of which 60 are operational now, many of these projects are targeting syndromes which impact low- and middle-income countries, including diarrheal disease, neonatal sepsis, gonorrhoea and urinary tract infections.

CARB-X | Annual Report | 12 October 2021 | [Online link](#)

Prediction of antimicrobial resistance based on whole-genome sequencing and machine learning

- Demonstrated models of logistic regression, support vector machine, random forest, and convolutional neural network to predict AMR against key antibiotics on whole-genome sequencing data.
- Provides a comprehensive evaluation of different machine learning algorithms for AMR prediction in *E. coli*.

Bioinformatics | Article | 6 October 2021 | [Online link](#)

Inter-species interactions alter antibiotic efficacy in bacterial communities

- Demonstrates that multi-drug resistant *S. maltophilia* can provide high levels of antibiotic protection to otherwise sensitive *P. aeruginosa* in model cystic fibrosis lung communities derived from clinical samples.

Nature | Article | 9 October 2021 | [Online link](#)

Antimicrobial resistance detection in Southeast Asian hospitals is critically important from both patient and societal perspectives, but what is its cost?

- Estimate of financial cost of setting up and running a microbiology laboratory as part of an AMR surveillance programme using top-down approach were calculated for twelve scenarios, considering three levels of automation including micro-costing approach for existing AMR labs.

PLoS GPH | Research Article | 13 October 2021 | [Online link](#)

Bacteriocin producing microbes with bactericidal activity against multidrug resistant pathogens

- Growth kinetics and antibacterial property of a novel bacteriocin-producing bacterial strain, *L. plantarum* LA21, isolated from fermented food effective against food borne pathogens such as *Bacillus pumilus*, *Bacillus amyloliquefaciens*, *Staph aureus* and *Listeria monocytogenes*.
- After further validation, these molecules can potentially be used as a feed additive, preservative in the agricultural field, and food industry as a novel antibacterial drug and food preservative.

JIPH | Article | 5 October 2021 | [Online link](#)

Antimicrobial resistance and virulence in *Helicobacter pylori*: Genomic insights

- Genome based analyses of 54 Indian *H. pylori* strains revealed plasticity of its genome and the primary mechanism of its antibiotic resistance is target modifications.
- Understanding the prevalence and the molecular identity of resistance traits will be useful to develop molecular diagnostic tools for rapid detection of resistance alleles in the *H. pylori* genome.

Genomics | Article | 5 October 2021 | [Online link](#)

Strategic priority 6: Collaborations

Proposed roadmap for the adaptation and implementation of WHO policy guidance on integrated antimicrobial stewardship in the human health sector

- Policy guidance for governments on coordination and collaboration with global and regional partners addressing the strengths, challenges and technical cooperation requirements to ensure effective implementation of the WHO policy guidance on integrated antimicrobial stewardship activities in human health.

PAHO | Roadmap | 12 October 2021 | [Online link](#)

High-level dialogue on the silent pandemic of antibiotic resistance

- Aimed to reflect on lessons learned from COVID-19 in order to aid the international community in better confronting emerging health threats, including antimicrobial resistance, and calls for increased collective action to address drug resistant infections the overuse and misuse of antibiotics combined with a lack of investment in research and development.
- Includes a video on are we ready for the silent pandemic of antibiotic resistance?

GARDP | News | 28 September 2021 | [Online link](#)

Collaborate to stop antimicrobial resistance – for the sake of the planet

- Highlights the need for collaborative efforts between researchers and policy makers to narrow the gap between research and policy to stop AMR.
- Multiple stakeholders and sectors should work together to implement effective research programmes and legislation along with adequate funding of research to develop new antimicrobials is crucial to overcome the inevitable resistance to existing drugs.

The Lancet | News | 1 October 2021 | [Online link](#)

New coalitions announced at the UN food systems summit to increase access to healthy diets from sustainable food systems

- Fair, equitable and sustainable transformation of food systems is an urgent priority as health and nutrition are cross-cutting and have causal links to environmental contamination, animal health and zoonosis, and increased global rates of AMR.
- UN Food Systems Summit aims to deliver progress on all 17 SDGs through a food systems approach, leveraging interconnectedness of food systems to global challenges – malnutrition, climate change, poverty and inequality.

WHO | News | 23 September 2021 | [Online link](#)

IDSA response to federal response to antimicrobial resistance

- Recent allocation of American Rescue Plan funds to support infection prevention and efforts to combat AMR will help to strengthen AMR infrastructure to effectively combat drug-resistant infections by
 - Expanding antibiotic resistance laboratory testing
 - Supporting a stewardship leader in each state on improving antibiotic use, with a focus on health equity
 - Increasing the number of health care facilities that report antibiotic use and resistance data to the CDC National Healthcare Safety Network.

IDSA | News | 17 September 2021 | [Online link](#)

Urgent, comprehensive federal action needed to stem mortality and Medicare costs associated with antimicrobial resistance

- Call for increased funding to strengthen public health infrastructure to facilitate the necessary surveillance as real-time data, rather than estimates, is needed to better inform policies and decision-making.

CID | Viewpoints | 7 October 2021 | [Online link](#)