

*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 5

- World Antimicrobial Awareness Week (WAAW) 2021
- *E. coli* as a potential indicator for surveillance of AMR in the environment
- Reducing surgical site infections in low-income and middle-income countries
- Pediatric antimicrobial stewardship for respiratory infections
- Antimicrobial Resistance Benchmark 2021
- Antimicrobial resistance and the United Nations sustainable development cooperation framework

Strategic priority 1: Awareness and understanding

World Antimicrobial Awareness Week (WAAW) 2021

- WHO's annual campaign to raise AMR awareness is celebrated every year on 18–24 November with the slogan – *Antimicrobials: Handle With Care*.
- WAAW 2021 theme – *Spread Awareness, Stop Resistance* – called on One Health AMR stakeholders, policymakers, health care providers, and the general public to be AMR awareness champions.
- WHO HQ webpage contains global resources and encouraged all stakeholders to "Go Blue" on 24 November
- WHO Country Office (WCO) India webpage contains IEC adapted for an Indian audience

WHO | Campaign | 24 November 2021 | [Online link \(HQ\)](#) | [Online link \(WCO India\)](#)

The growing threat of antimicrobial resistance in India

- Documents the interview with a professor of medicine and international health at Johns Hopkins University, for her article on surveillance of multi-drug resistance organisms in India, at a global conference on AMR.
- Antimicrobial resistance to carbapenems is 20 times higher in India than in the US which highlights the need for robust surveillance systems to detect and contain new resistant variants.

Contagion Live | News | 12 November 2021 | [Online link](#)

Exploring antibiotic prescribing in public & private primary care settings in Singapore

- VALUE model conceptualises key components of appropriate antibiotic prescribing and stewardship in primary care which include values and alignment, liaison with patients, use of monitoring and evaluation of data.
- Highlights the opportunities for national interventions to improve antibiotic prescribing in primary care.

BMC Family Practice | Research | 15 October 2021 | [Online link](#)

An understanding of the drivers of infectious diseases in the modern world can aid early control of future pandemics

- Understanding some of the drivers of infectious diseases, antimicrobial resistance, vaccination, and vaccine hesitancy is a step towards thriving in the modern world and adequately controlling future pandemics.
- Suggests collective work through professional bodies of pharmacists as they are strategically placed to advance the consumer education in understanding and ensuring judicious use of antibiotics

Pharmacy | Commentary | 3 November 2021 | [Online link](#)

Pet owners and antibiotics: knowledge, opinions, expectations, and communication preferences

- Most pet owners recognized the limitations of antibiotic therapy and the risks associated with antibiotic use, but 50% of them believed the risks were confined to the treated animal and only a minority were aware of transfer of bacteria across species.
- Findings suggest that veterinary communications about responsible antibiotic use should address the gaps in pet owners understanding regarding antibiotic resistance.

Antibiotics | Article | 29 October 2021 | [Online link](#)

One Health approaches contribute towards antimicrobial resistance: Malaysian perspective

- Highlights the need for research assessing the coexistence of AMR in healthcare, animal husbandry and environment, to fill huge gaps in information and knowledge of AMR in lower- and middle-income countries.
- Understanding the elements like knowledge, social behaviour, attitudes, peer pressure, and biophysical environment in the utilization of antimicrobial drugs among the different sectors is essential to develop and implement policies to curb AMR development and transmission.

Frontiers in Microbiology | Mini review | 25 October 2021 | [Online link](#)

Strategic priority 2: Laboratories and surveillance

The potential of using *E. coli* as an indicator for the surveillance of antimicrobial resistance (AMR) in the environment

- Proposes multi-drug resistant *Escherichia coli* as an indicator for monitoring occurrence and levels of AMR in the environment, including wildlife as verified methods for isolation and characterization are easily available.
- Highlights the urgent need to initiate environmental AMR monitoring programs nationally and globally, which will complement existing systems in different sectors.

Current Opinion in Microbiology | Article | 2021 | [Online link](#)

Implementation of the World Health Organization Global Antimicrobial Resistance Surveillance System in Uganda, 2015-2020

- Describes the progress in Uganda towards establishment and implementation of the national AMR surveillance programme, in alignment with WHO Global Antimicrobial resistance Surveillance System (GLASS).
- Reported data indicate high resistance to recommended and prescribed antibiotics for treatment of infections, which suggests more efforts are needed regarding quality assurance of laboratory testing methodologies to ensure optimal adherence to GLASS-recommended pathogen-antimicrobial combinations.

JMIR Public Health Surveillance | Article | 21 October 2021 | [Online link](#)

Whole-genomic analysis of NDM-5-producing Enterobacteriaceae recovered from an urban river in China

- Three NDM-5-producing *Escherichia coli*, *Klebsiella pneumoniae*, and *Citrobacter braakii*, harboured virulence blaNDM-5 genes, on plasmids, which were successfully transferred to *E. coli* J53 by conjugation experiments.
- Contamination of the urban river ecosystems by clinically significant carbapenemase gene blaNDM-5, highlights the need for a constant surveillance of carbapenemase-producing Enterobacteriaceae in the environment under One Health perspective.

Infection and Drug Resistance | Original research | 27 October 2021 | [Online link](#)

Isolation, characterization, and resistance profile of Salmonella spp. from chicken cuts

- Seventeen different resistance profiles were found among 28 isolates in Brazil, of which 46.42% had a multi-resistance profile, and 21.4% of the isolates had a phenotype for ESBL production.
- High levels of resistance to antimicrobials of different classes and generations, which serves as a warning, as it puts the human treatment of salmonellosis at risk.

SPMC | Article | 2021 | [Online link](#)

Strategic priority 3: Infection prevention and control

Clonal spread of carbapenem-resistant *Klebsiella pneumoniae* among patients at admission and discharge at a Vietnamese neonatal intensive care unit

- Whole-genome sequencing revealed a population of carbapenem-resistant *Klebsiella pneumoniae* consisting mostly of ST15 isolates, along with clinical isolates collected from previous years that were most likely clonally descended from ST15 isolates. NDM-type carbapenemase and KPC-2-encoding genes were the common carbapenem resistance genes observed and most isolates belonged to three distinct clonal clusters of ST15.
- This suggest that a successful hospital strain can colonise inpatients and highlights the importance of continued monitoring.

BMC | Research | 20 November 2021 | [Online link](#)

Reducing surgical site infections in low-income and middle-income countries (FALCON): a pragmatic, multicentre, stratified, randomised controlled trial

- Trial undertaken in 54 hospitals in seven countries including India, to test WHO guidelines to prevent SSI which recommend alcoholic chlorhexidine skin preparation and fascial closure using triclosan-coated sutures as both interventions are more expensive than alternatives for routine use.
- Finding did not show any benefit of 2% alcoholic chlorhexidine skin preparation compared with povidone-iodine, or with triclosan-coated sutures compared with non-coated sutures, in preventing SSI.

The Lancet | Article | 6 November 2021 | [Online link](#)

Assessment of knowledge and implementation practices of the ventilator acquired pneumonia (VAP) bundle in the intensive care unit of a private hospital

- Key findings identified as the main barriers to VAP bundle adherence were – knowledge gap among nurses and infection control practitioners regarding VAP prevention strategies, poor adherence to specific components of the VAP bundle, and lack of education and formal training.
- Advocates regular formal training and interactive educational sessions to assess the competency of key personnel regarding the VAP bundle.

ARIC | Short report | 12 November 2021 | [Online link](#)

Droplets generated from toilets during urination as a possible vehicle of carbapenem-resistant *Klebsiella pneumoniae*

- Bacteria can be mobilized from the toilet bowl and microbiology experiments showed that an innovative foam layer can suppress this mobilization.
- Study demonstrated that droplets generated from toilets during urination can be a hidden source of carbapenem-resistant *Klebsiella pneumoniae* transmission in settings where toilets are shared.

ARIC | Research | 20 November 2021 | [Online link](#)

Strategic priority 4: Optimise use of antimicrobials

Paediatric antimicrobial stewardship for respiratory infections in the emergency setting

- Antimicrobial stewardship interventions and outcomes in thirteen studies showed an overall reduction in antibiotic use, increased prescription of narrow-spectrum antibiotics and shorter duration of antibiotic therapy.
- Multimodal interventions that were education-based and those that used rapid respiratory pathogen testing were found to be the most effective.

Antibiotics | Systematic review | 8 November 2021 | [Online link](#)

Management of pneumonia in critically ill patients

- Establishing an etiological diagnosis is challenging in most patients with severe pneumonia, despite early diagnosis and antimicrobial treatment being crucial in improving survival among critically ill patients.
- Emphasises continuing research on severe pneumonia inviting different perspectives on host immunological responses, assessment of illness severity, microbial causes, risk factors for multidrug resistant pathogens, diagnostic tests, and therapeutic options.

BMJ | Clinical review | 6 December 2021 | [Online link](#)

In-vitro selection of Ceftazidime/Avibactam resistance in OXA-48-like-expressing *Klebsiella pneumoniae*: in-vitro and in-vivo fitness, genetic basis and activities of β -lactam plus novel β -lactamase inhibitor or β -lactam enhancer combinations

- Ceftazidime/avibactam-selected mutants showing modifications in proteins linked to efflux, outer membrane permeability and/or stress response pathways, yielded lower MICs to zidebactam, in combination with either cefepime or ceftazidime and cefepime/avibactam.
- Suggests continued monitoring of ceftazidime/avibactam resistance among OXA-48 genotypes.

Antibiotics | Article | 29 October 2021 | [Online link](#)

***Pseudomonas aeruginosa* susceptibility in Spain: antimicrobial activity and resistance suppression evaluation by PK/PD analysis**

- Most active antimicrobials were ceftazidime/avibactam followed by ceftolozane/tazobactam and colistin with differences depending on the admission service, sample type, and dose regimen.
- Discrepancies detected between EUCAST-susceptibility breakpoints for *P. aeruginosa* and those estimated by PK/PD analysis.

Pharmaceutics | Article | 8 November 2021 | [Online link](#)

***Staphylococcus aureus* – selective reporting of antibiogram results and its impact on antibiotic use**

- Use of narrow-spectrum beta-lactams more than doubled after implementing selective reporting with use of intravenous flucloxacillin/cefazolin for *S. aureus* bacteraemia. Recommends implementing selective reporting rules into the national/international standards for susceptibility reporting as an AMS tool.

ARIC | Research | 6 November 2021 | [Online link](#)

Occurrence and multidrug resistance of *Campylobacter* spp. at duck farms and associated environmental and anthropogenic risk factors in Bangladesh

- *Campylobacter* spp. was detected in overall 155 out of 420 samples from drinking water, cloacal swab, egg surface swab and soil of the duck resting places with majority being *C. coli* isolates, while multidrug resistance (MDR) was notably found more in *C. jejuni* than *C. coli* strains.
- Demonstrates that duck farms contribute to occurrence and spread of potentially pathogenic and MDR *C. coli* and *C. jejuni* strains, suggesting a long-term holistic research at the environment-animal-human interface.

BMC infectious Diseases | Research | 7 November 2021 | [Online link](#)

Non-biomedical factors affecting antibiotic use in the community: a mixed-methods systematic review and meta-analysis

- Risk factors for self-medication with antibiotics were identified as pro-attitudes for self-medication with antibiotics, relatives with medical backgrounds, older age, living in rural areas, and storing antibiotics at home.
- Non-prescription antibiotic use and irresponsible prescriptions in the community are widely prevalent and future AMR strategies should include community-based interventions.

CMI | Systematic review | 10 November 2021 | [Online link](#)

Strategic priority 5: Research, innovations and finance

Antimicrobial Resistance Benchmark 2021

- Evaluates pharmaceutical industry's response to the challenge of AMR by examining 17 pharmaceutical companies producing antimicrobials. Proposes collaborative and coordinated action with support from policy makers and investors, through partnerships.

AMF | Report | 18 November 2021 | [Online link](#)

Nanotechnology as a novel approach in combating microbes providing an alternative to antibiotics

- Study emphasizes the antimicrobial effects of nanoparticles and contrasts their role with antibiotics.
- Explores the promising potential of nanoparticles in healthcare in providing a new solution to the crisis of AMR.

Antibiotics | Review | 30 November 2021 | [Online link](#)

Assessing the accuracy of a new hand hygiene monitoring device

- A new device (SmartRub®) captures hand hygiene actions by measuring volume of alcohol based hand rub (ABHR) used and duration of hand friction to capture HCWs' behaviour associated with ABHR.
- Such devices can help to monitor hand hygiene and facilitate behaviour change, which are critical for effective infection prevention and control.

ARIC | Research | 6 November 2021 | [Online link](#)

Discordance between different bioinformatic methods for identifying resistance genes from short-read genomic data, with a focus on *Escherichia coli*

- Simulated datasets and real data on *E. coli* were processed using four different bioinformatic programs which showed 76% of isolates in real data had discrepant allele calls for at least one gene.
- Running multiple algorithms and comparing outputs generated on the same dataset can help identify and resolve these artefacts, but new and more robust genotyping algorithms are needed for future.

Europe PMC | Article | 3 November 2021 | [Online link](#)

Strategic priority 6: Collaborations

Antimicrobial resistance and the United Nations sustainable development cooperation framework

- Builds the case for AMR as a development issue and component of broader issues such as One Health, Universal Health Coverage (UHC) and health security, food systems and planetary health.
- Aims to establish AMR as a higher priority on the policy and development agenda to stimulate multi-stakeholder interest and attract funding.

WHO | Guidance | 26 October 2021 | [Online link](#)

More countries committing to tackling antimicrobial resistance

- Latest annual global survey of implementation of the Global Action Plan on addressing AMR noted the negative impacted of COVID-19 related challenges on development and implementation of national plans to tackle AMR.
- Highlights an urgent need to expedite the prioritization, costing, implementation and monitoring of AMR activities and to build capacity, awareness about AMR along with strengthening political commitment.

WHO | News | 11 November 2021 | [Online link](#)

India's National Action Plan on Antimicrobial Resistance: a critical perspective

- India's National Action Plan on AMR is well aligned with the Global Action Plan on AMR but lacks separate financial allocations for AMR initiatives across different states in India, poor enforcement and inadequate multisectoral co-ordination.

JGAR | Short communication | 22 October 2021 | [Online link](#)

Pacific regional infectious disease association (PRIDA): capacity-building for microbiology and infectious disease across the Pacific

- PRIDA, an Australian based network of medical and scientific specialists currently involved in AMR projects in the Pacific, focuses on grassroots support for Pacific and Southeast Asian sites through the establishment of long-term mentoring relationships with front line health care workers.

Microbiology Australia | Research article | 8 November 2021 | [Online link](#)

ICARS and GAMRIF join hands to tackle AMR in partnership with Porkcolombia

- International Centre for Antimicrobial Resistance Solutions has collaborated with UK Global AMR Innovation Fund to tackle AMR by funding to improve uptake of disease diagnostics at pig farms in Colombia.

ICARS | News | 21 October 2021 | [Online link](#)