

*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, according to the strategic priorities of India's National Action Plan on AMR. Kindly note, inclusion of publications and resources in this review/compilation does not imply an endorsement by WHO.

Key highlights of volume 2

- OpenWHO – new channel for courses on antimicrobial resistance
- Global Leaders Group on surveillance of antimicrobial resistance and use
- Hospital-acquired infections in ICUs of a tertiary care hospital in North India
- Consumption of antibiotics in Europe
- Global Leaders Group on financing to address antimicrobial resistance
- UN Call to Action on Antimicrobial Resistance 2021

Strategic priority 1: Awareness and understanding

OpenWHO – new channel for courses on antimicrobial resistance

- A new channel on "Antimicrobial Resistance" has been introduced on OpenWHO – WHO's interactive web-based knowledge transfer platform to support capacity/skill development of health care worker competencies to combat AMR in clinical practice
- Currently, two courses are available: [Antimicrobial Stewardship: a competency-based approach](#) and [Drug-resistant tuberculosis: how to interpret rapid molecular test results](#).

OpenWHO | Online channel | 2021 | [Online link](#)

Fresh approaches to the study of antimicrobials in society

- Final report of the Antimicrobials In Society (AMIS) programme (2017-2021), highlighting the work on the three key commitments of the AMIS programme: research, stakeholder engagement and promoting fresh approaches
- Summarises the key activities, findings and outputs from across the AMIS programme

AMIS/LSHTM | Report | July 2021 | [Online link](#)

Prescribers' knowledge, attitudes and behaviors on antibiotics, antibiotic use and antibiotic resistance in Jordan

- Physicians' knowledge regarding antibiotic resistance was found to be higher compared to dentists and was significantly linked to more years in practice.
- Highlights need for a robust system for educating practitioners about local and global antibiotic use and AMR.

Antibiotics | Article | 15 July 2021 | [Online link](#)

The dangers of a post-antibiotic era; why do we need to act now?

- Educative video on antimicrobial resistance to educate the general public, especially the youth
- Tells the story of antibiotics and encourages the viewers to work together to raise awareness on AMR.

Students' Against Superbugs Africa | Video | 29 July 2021 | [Online link](#)

Assessment of knowledge, attitude, and practice among dental students toward antibiotic usage and development of antimicrobial resistance – a cross-sectional study

- Out of the 120 undergraduate and postgraduate students from various dental colleges, 81.7% were aware of antibiotic resistance and 50% felt antibiotic prescription, not being necessary for managing oral diseases. 54.2% prescribed antibiotic without prior antibiotic sensitivity testing.
- Authors suggest educational program and guidelines for improving knowledge on antibiotic use and AMR.

Journal of Advanced Clinical & Research Insights | Research article | 16 June 2021 | [Online link](#)

Strategic priority 2: Laboratories and surveillance

Surveillance of antimicrobial resistance and use

- Surveillance of antimicrobial resistance and use is critical to support an effective One Health response to AMR. Although human health sector has data on antimicrobial resistance and use, and animal sector also has some data; there is a paucity of data from plant sector and the environment.
- More financial resources and strengthening of infrastructure and technical capacity is needed, especially in low- and middle-income countries, and translation of data into information for action is needed at all levels.
- Surveillance efforts at global, regional, national and local level must be coordinated and aligned for data sharing, collaboration and partnerships across countries, sectors, companies and organizations.

Global Leaders Group on Antimicrobial Resistance | Information note | July 2021 | [Online link](#)

Antimicrobial resistance in Enterobacteriaceae bacteria causing infection in trauma patients: a 5-year experience from a tertiary trauma center

- Retrospective evaluation of 5 years data from the laboratory information system to analyse AMR patterns of Enterobacteriaceae in trauma patients from a tertiary care trauma centre in Delhi.
- Most common gram-negative pathogens causing nosocomial infections were *Klebsiella* spp., followed by *E. coli* and *Enterobacter* spp. in ICUs and *E. coli* followed by *Klebsiella* spp. and *Enterobacter* spp. in OPD patients respectively.

Journal of Laboratory Physicians | Original article | 10 July 2021 | [Online link](#)

Geographically targeted surveillance of livestock could help prioritize intervention against antimicrobial resistance in China

- Authors mapped AMR rates in animals, combined with geospatial models, using surveys of event-based surveillance between 2000 and 2019 for foodborne bacteria.
- Eastern China currently has the highest AMR rates, and south-western and north-eastern China would benefit the most from additional surveillance efforts.
- China is the largest global consumer of veterinary antimicrobials and geographically targeted surveillance is recommended as a feasible option for optimizing surveillance efforts and slowing the spread of AMR as it could reduce AMR prediction uncertainty by two-fold.

Nature Food | Article | 26 July 2021 | [Online link](#)

resistancebank.org, an open-access repository for surveys of antimicrobial resistance in animals

- Online platform that centralizes information on AMR in animals from LMICs, and includes resistance rates for pathogens isolated from chickens, cattle, sheep, and pigs.
- It is a platform reporting large-scale trends in AMR – to help international funders target their efforts in the short term and facilitate the development of a global systematic surveillance system in the long term.

Scientific Data | Article | 22 July 2021 | [Online link](#)

Evaluation of the InTray and Compact Dry culture systems for the diagnosis of urinary tract infections in patients presenting to primary health clinics in Harare, Zimbabwe

- The study evaluated the performance of InTray COLOREX Screen/ESBL and Compact Dry culture systems for detection of uropathogens and extended-spectrum beta-lactamase (ESBL)-producing organisms in urine.
- Findings show good performance of the novel culture systems for the detection of uropathogens and ESBL-producing organisms which can simplify laboratory workflow, reduce processing time and facilitate expansion and decentralization of laboratory testing for AMR.

European Journal of Clinical Microbiology & Infectious Diseases | Original article | 22 July 2021 | [Online link](#)

Nationwide surveillance and molecular characterization of critically drug-resistant Gram-negative bacteria: results of the Research University Network Thailand study

- More than 187,000 isolates of four clinically significant Gram-negative bacteria isolated from blood, respiratory tract, urine, and sterile samples were monitored from 47 hospitals across Thailand.
- Roughly 14% isolates were randomly selected for molecular characterization, which found a high percentage of the isolates carrying beta-lactamase and carbapenemase genes.

Antimicrobial Agents & Chemotherapy | Research article | 28 June 2021 | [Online link](#)

First 'One-Health' study on genome-wide comparison of multidrug-resistant *Escherichia coli* from human-animal-aquaculture-environment continuum: a collective effort from six institutes of India

- *E. coli* isolates from animals, food of animal origin, human, hospitals and environment collected by 6 institutions across India were analysed by whole genome sequencing and subjected to gene characterization and gene mining.
- Frequency of resistance, co-resistance, and resistant genes were high and similar across the human-animal-aquaculture-environment continuum in India, emphasizing the need for a 'One Health' approach.

Authorea | Preprint article | 20 June 2021 | [Online link](#)

Strategic priority 3: Infection prevention and control

Point-prevalence survey for the hospital-acquired infections in intensive care units of trauma center in a tertiary care hospital of Northern India

- Point prevalence of healthcare associated infections (HAI) in the study (30.4%) was 5-6 times higher compared to developed countries.
- Gram-negative organisms were the predominant cause, with *Acinetobacter baumannii*, being the commonest.
- Point prevalence surveys are an important part of antimicrobial stewardship to address AMR in hospital settings, to aid the administrators in benchmarking to improve patient outcomes.

Journal of Laboratory Physicians | Original article | 14 July 2021 | [Online link](#)

Antibiotic resistance in predominantly occurring gram-negative bacterial community from treated sewage Jaipur to assess the need for going beyond coliform standards

- The Gram-negative isolates from treated sewage in Jaipur were tested and found to be resistant to many antibiotics, including colistin.
- The study proposes risk assessment of wastewater reuse by detecting predominant bacterial flora as a step towards development of new microbiological standards for wastewater.

Water Quality Research Journal | Research article | 30 July 2021 | [Online link](#)

Distribution and molecular characterization of ESBL, pAmpC β -lactamases, and non- β -lactam encoding genes in Enterobacteriaceae isolated from hospital wastewater in Eastern Cape Province, South Africa

- Study evaluated the occurrence of extended-spectrum β -lactamases (ESBL), plasmid-encoded genetic determinants and some non- β -lactam genes in Enterobacteriaceae isolates isolated from hospital wastewater.
- Results showed that hospital wastewater is laden with potentially pathogenic multi-drug resistant organisms with various antibiotic resistance genes that can spread to humans through the food chain, if wastewater is not treated properly before discharge into the environment.

PLoS ONE | Research article | 21 July 2021 | [Online link](#)

Pharmaceutical residues in hospital wastewater

- Explores how hospital wastewater contributes to pharmaceutical pollution of the environment by featuring 5 case studies from European hospitals and how they deal with the issue.
- Recommends 5 courses of action for hospitals to develop strategies in dealing with pharmaceutical residues in their wastewater: 1) investigate 2) educate 3) develop partnerships 4) raise awareness and 5) leverage influence.

Health Care Without Harm | Report | July 2021 | [Online link](#)

Addressing antimicrobial resistance by improving access and quality of care – a review of the literature from East Africa

- For balancing the need for universal and equitable access and for accurate, non-excessive usage of drugs, authors advocate targeting various dimensions of existing framework capturing variability of access to healthcare in low-resource settings namely – availability, accessibility, affordability, adequacy, acceptability and aspects of quality.
- Interventions involving key players in the system, from patients and farmers to healthcare staff and policy makers, offer opportunities to improve health outcomes while simultaneously counteracting the AMR crisis.

PLOS Neglected Tropical Diseases | Review | 22 July 2021 | [Online link](#)

Regional consultative workshop on antimicrobial resistance risk associated with aquaculture in the Asia-Pacific

- Addressing AMR risks in aquaculture has been included as an integral component of FAO's One Health initiative being implemented in the Asia-Pacific region.
- Report recommends specific actions for better governance of AMU in aquaculture and mitigation of AMR risk associated with aquaculture for human and environmental health and sustainable development of the aquaculture sector in the region.

FAO | Report | 2021 | [Online link](#)

Strategic priority 4: Optimise use of antimicrobials

Consumption of antibiotics in the community, European Union/European Economic Area, 1997–2017: data collection, management and analysis

- Updated analyses of two decades of European Surveillance of Antimicrobial Consumption Network (ESAC-Net) data provides the most comprehensive and detailed description of antibiotic consumption in the community in Europe.

Journal of Antimicrobial Chemotherapy | Article | 1 Aug 2021 | [Online link](#)

Efficacy and safety of discontinuing antibiotic treatment for uncomplicated respiratory tract infections when deemed unnecessary – a multi-centre, randomised clinical trial in primary care

- Study was a multicentre, open-label, randomised, parallel-group trial conducted between January 2017 and February 2020.
- Results showed that discontinuing an antibiotic for uncomplicated respiratory tract infection (RTI), which the doctor felt was not indicated, is safe and had no influence on the clinical outcome.

Clinical Microbiology and Infection | Original Article | 3 Aug 2021 | [Online link](#)

A rapid review of the overuse of antibiotics during the COVID-19 pandemic: lessons learned and recommendations for the future

- Antibiotic use in 37–100% of COVID-19 patients far outweighed the rates of secondary bacterial infections, typically below 20%. Lack of consistent reporting of causative microorganisms of secondary infections was evident, and distinction between bacterial and viral induced sepsis was rarely made.
- Health policy and treatment guidelines are recommended to be changed to improve the clinical outcomes of patients with severe COVID-19 and to reduce the emergence of antimicrobial resistance.

AMRC Open Research | Systematic review | 6 July 2021 | [Online link](#)

Sales of antibiotics and hydroxychloroquine in India during the COVID-19 epidemic: an interrupted time series analysis

- Authors estimate that between June and September 2020, with peak epidemic activity, COVID-19 likely contributed to excess sales of 216 million doses of non-child-appropriate formulation (non-CAF) of antibiotics and 38 million doses of non-CAF azithromycin in India.
- Antimicrobial stewardship interventions have never been so critical, and mass media awareness campaigns targeting prescribers and the general public to discourage the routine use of antibiotics for COVID-19 need to be rapidly implemented in India and other LMICs.

PLoS Medicine | Research Article | 1 July 2021 | [Online link](#)

Animal nutrition strategies and options to reduce the use of antimicrobials in animal production

- Dietary measures adopted alongside biosecurity, genetics, animal health care, animal welfare and farm management are the keys to success in improving animal health and welfare.
- AMR monitoring authorities have noted that a significant reduction in the use of certain antibiotics on farm animals has reversed the trend of rising resistance to these antibiotics.

FAO | Paper | 2021 | [Online link](#)

Antimicrobial consumption and resistance in bacteria from humans and animals

- Provides an integrated analysis of possible relationships between antimicrobial consumption (AMC) in humans and food-producing animals and the occurrence of AMR in bacteria from humans and food-producing animals.
- When assessed per kg biomass, the overall antimicrobial consumption was lower in food-producing animals than in humans during the timeframe covered in this report (2016–2018).
- Findings suggest that further interventions to reduce AMC will have a beneficial impact on the occurrence of AMR, underlining the need to promote prudent use of antimicrobial agents and infection control and prevention (IPC) in both humans and food-producing animals.

ECDC-EFSA-EMA | Inter-agency report | 2021 | [Online link](#)

Factors associated with longer than recommended durations of antibiotic therapy for uncomplicated ambulatory infections in an integrated healthcare system

- Across the ambulatory care network of an integrated health care system, nearly 40% of antibiotic prescriptions for uncomplicated infections were for longer than recommended durations, independent of factors like site of care, prescriber characteristics, and type of infection.
- Reducing excessive durations of therapy is an essential component of outpatient antimicrobial stewardship.

Open Forum Infectious Diseases | Article | 17 June 2021 | [Online link](#)

Strategic priority 5: Research and innovations

Financing to address antimicrobial resistance

- Increased investment is urgently needed to support countries, particularly LMICs, for sustainable implementation of national action plans on AMR.
- Although there is an economic case for investing in containment of AMR, robust estimates of costs and benefits are needed to stimulate investments.

Global Leaders Group on Antimicrobial Resistance | Information note | July 2021 | [Online link](#)

Improving vaccination coverage and timeliness through periodic intensification of routine immunization: evidence from Mission Indradhanush

- Study shows that large-scale periodic intensification of the routine immunization (PIRI) activities, such as Mission Indradhanush (MI), can potentially improve vaccination coverage and on-time vaccination (OTV) rates in India.
- Information campaigns should be used to promote the life-saving benefits of vaccines to address the barriers and demand-side drivers of vaccination to improve program success.

Annals of the New York Academy of Sciences | Original article | 15 July 2021 | [Online link](#)

Optimizing antimicrobial use in humans – review of current evidence and an interdisciplinary consensus on key priorities for research

- To achieve antimicrobial security, there needs a balance in AMR research efforts between development of new agents and strategies to preserve the efficacy and maximise effectiveness of existing agents.
- Authors identified research priorities for optimising antimicrobial use in humans across four broad themes – 1) policy and strategic planning; 2) medicines management and prescribing systems; 3) technology to optimise prescribing; and 4) context, culture and behaviours.

The Lancet Regional Health – Europe | Article | 29 June 2021 | [Online link](#)

Estimating the cost of achieving universal basic wash standards in health care facilities in the 46 least developed countries

- Probably the first global study to quantify the costs of achieving SDG 6 specifically in health care settings.
- Estimated cost to achieve universal coverage of WASH in the 46 least developed countries is US\$ 6.5-9.6 billion from 2021 to 2030

Preprints with The Lancet | Report | 2 June 2021 | [Online link](#)

Strategic priority 6: Collaborations

Call to Action on Antimicrobial Resistance 2021

- Calls for enhanced national and global efforts to tackle AMR through a One Health approach, for the acceleration of previous commitments to tackle AMR, for improved antimicrobial stewardship, for work towards financing for AMR action, for increased research on AMR's impacts, and for supporting the new One Health Global Leaders Group on AMR among other key steps.
- There are 113 Member State signatories to the Call to Action and 29 supporting organizations, till date.

WHO | News | 30 July 2021 | [Online link](#)

Multi-country cross-sectional study of colonization with multidrug-resistant organisms: protocol and methods for the antibiotic resistance in communities and hospitals (ARCH) studies

- Probably the first study to use a common protocol to evaluate population-based prevalence and risk factors associated with multidrug-resistant organisms (MDRO) colonization among community-dwelling and hospitalized adults in multiple countries with diverse epidemiological conditions, including low- and middle-income (LMIC) settings.
- Results will add important information to existing surveillance approaches to track antimicrobial resistance and will provide insights on strategies to combat this global threat.

BMC Public Health | Study protocol | 16 July 2021 | [Online link](#)