

## Sameeksha\* – Antimicrobial Resistance (AMR)

### Key highlights

- Unqualified antibiotic prescription for children with fever/cough in LMICs
- Implications of reducing antibiotic treatment duration on antimicrobial resistance in hospital settings
- Burden of vaccine preventable bacterial antimicrobial resistance
- Sameeksha on Infection Prevention and Control expands its scope beyond COVID-19
- Quadripartite One Health priority research agenda for AMR
- Collateral impact of COVID-19 pandemic on nosocomial spread of antibiotic resistance
- Impact of antibiotic use on gut microbiome

## Strategic priority 1: Awareness and understanding

### Global knowledge gaps on antimicrobial resistance in the human health sector: a scoping review

- Identifies knowledge gaps across 14 AMR areas, focussed on WHO's priority pathogens lists, including *Mycobacterium tuberculosis*, *Candida* and *Aspergillus spp.*
- Findings guided the development of the WHO Global AMR research agenda for human health.

*International Journal of Infectious Diseases* | Review article | 8 June 2023 | [Online link](#)

### Knowledge, attitude, and practice (KAP) survey on the management of multidrug-resistant gram-negative infections with innovative antibiotics: focus on ceftazidime–avibactam

- A majority of health care professionals reported the need for new antibiotics for multi drug resistant (MDR) gram negative infections.
- Ceftazidime-avibactam could be an effective alternative but needs rigorous stewardship in clinical practice.

*Cureus* | Research article | 19 May 2023 | [Online link](#)

## Strategic priority 2: Laboratories and surveillance

### Evaluating the relationship between community water and sanitation access and the global burden of antibiotic resistance: an ecological study

- Human faecal metagenomic data identified 1589 metagenomes from 26 countries showed that improved water, sanitation and hygiene (WASH) was associated with lower abundance of antibiotic resistance genes (ARG).
- Better access to WASH in the community could help curb AMR, especially in low- and middle-income countries.

*Lancet Microbe* | Research article | 30 June 2023 | [Online link](#)

## Patterns of antibiotic use, pathogens, and prediction of mortality in hospitalized neonates and young infants with sepsis: a global neonatal sepsis observational cohort study (NeoOBS)

- Assessed antibiotic treatment and clinical outcomes in hospitalized neonates in low- and middle-income countries (LMICs) and developed a neonatal sepsis severity score for mortality prediction.
- Patterns of routine antimicrobial use differ from WHO guidelines, and significant mortality and AMR burden calls for rigorous randomised control trials for optimal empiric treatment strategies in LMICs.

*PLoS Medicine* | Research article | 8 June 2023 | [Online link](#)

## Chronicity of high and low level mupirocin resistance in *Staphylococcus aureus* from 30 Indian hospitals

- Extensive use of mupirocin for dermatitis, nasal carriage and decolonization of methicillin resistant *Staphylococcus aureus* (MRSA) has led to mupirocin resistance in MRSA.
- MRSA isolates showed high level resistance (12%) as well as low level resistance (10%) to mupirocin, emphasizing the need for guidelines for regulating mupirocin use, and continuous surveillance.

*Scientific Reports* | Research article | 22 June 2023 | [Online link](#)

## A scoping review of factors associated with antimicrobial-resistant *Campylobacter* species infections in humans

- Reports important factors related to resistant *Campylobacter* infections including travel, prior antimicrobial use, food consumption and handling, water consumption and exposure, and animal contact.
- Highlights the need for a One Health research approach for AMR in *Campylobacter*.

*Epidemiology & Infection* | Review article | 7 June 2023 | [Online link](#)

## Evidence of antibiotic resistance and virulence factors in environmental isolates of *Vibrio* species

- Testing of environmental samples from Vaishali district of Bihar, revealed five *Vibrio* species with significant resistance to ampicillin and cephalexin, phage induction and virulence gene profiles.
- The authors opine that the district might be the next hotspot of cholera and non-cholera associated diseases in the future.

*Antibiotics* | Research article | 16 June 2023 | [Online link](#)

## Strategic priority 3: Infection prevention and control

### Sameeksha – Infection Prevention and Control | volume 1

The scope of IPC Sameeksha is not limited to COVID-19 and has been expanded to cover all aspects of infection prevention and control.

- WHO report on WASH, waste and electricity services in health care facilities
- More evidence needed on nudges as a suitable and effective intervention to improve hand hygiene compliance
- IPC assessments to ensure safe infant feeding in healthcare facilities: experience from 3 countries
- Textiles as fomites in the healthcare system
- Summaries of APSIC IPC guidelines for catheter-associated urinary tract infections and dental infections

*WCO India* | Publication | 7 July 2023 | [Online link](#)

## Strategic priority 4: Optimise use of antimicrobials

### Antibiotic prescription from qualified sources for children with fever/cough: cross-sectional study from 59 low- and middle-income countries

- Demographic and health survey datasets of under five children with fever/cough in LMICs showed that 1 in 4 children received antibiotics from unqualified sources.
- Emphasises the importance of national efforts to regulate prescriptions of antibiotics in LMICs.

*eClinicalMedicine* | Scientific article | 29 June 2023 | [Online link](#)

### Establishing an effective antimicrobial stewardship program at four secondary-care hospitals in India using a hub-and-spoke model

- Details an approach for implementation of antimicrobial stewardship programs at resource poor, secondary care hospitals, including rigorous local training in clinical and laboratory settings.
- This hub-and-spoke model of ASP was successful in implementing ASPs in secondary-care hospitals and can be replicated by other tertiary care hospitals.

*Antimicrobial Stewardship & Healthcare Epidemiology* | Scientific article | 9 June 2023 | [Online link](#)

### Antibiotic prescribing behavior among physicians in Asia: a multinational survey

- Survey of Asian physicians shows that antibiotic prescription behaviours (APB) vary at each stage of prescription – initial, on-treatment and de-escalation – across clinical specialties.
- Recommends educating prescribers about appropriate investigation, partnership with infectious disease physicians, as well as availability and adherence with national guidelines to guide appropriate APB among different specialties.

*Antimicrobial Stewardship & Healthcare Epidemiology* | Scientific article | 29 June 2023 | [Online link](#)

### Implications of reducing antibiotic treatment duration for antimicrobial resistance in hospital settings: a modelling study and meta-analysis

- Assessed effectiveness of reduced antibiotic treatment duration in reduction of antimicrobial resistance.
- Provides theoretical and empirical evidence that confirms that reduced antibiotic treatment leads to reduction of resistance carriage but also highlights certain circumstances where it may increase resistance.
- Recommends that future antibiotic duration trials should monitor antibiotic-resistant bacteria colonisation as an outcome to guide antibiotic stewardship policies.

*PLoS Medicine* | Scientific article | 15 June 2023 | [Online link](#)

### The battle against fungi: lessons in antifungal stewardship from COVID 19 times

- Reviewed antifungal stewardship (AFS) for 3 COVID-19 associated fungal infections: candidemia, pulmonary aspergillosis and mucormycosis; and provides key recommendations for AFS.

*International Journal of Antimicrobial Agents* | Review article | 1 July 2023 | [Online link](#)

### Drivers of inappropriate antibiotic use in low- and middle-income countries

- Defines and reviews key drivers of inappropriate antibiotic use in LMICs.
- Provides recommendations for governments for policy-making, commitment and interventions.

*JAC-Antimicrobial Resistance* | Review article | 31 May 2023 | [Online link](#)

## Strategic priority 5: Research, innovations, and finance

### Global and regional burden of attributable and associated bacterial antimicrobial resistance avertable by vaccination: modelling study

- Estimates the AMR burden that can be avoided by vaccination for 15 bacterial pathogens.
- Recommends scaling up vaccines to high AMR burden regions and prioritise novel vaccine development.

*BMJ Global Health* | Scientific article | 6 July 2023 | [Online link](#)

### Antimicrobial susceptibility assays for *Neisseria gonorrhoeae*: a proof-of-principle population-based retrospective analysis

- Analysis of 12 years of Australian data shows that molecular antimicrobial susceptibility tests could improve AMS by reducing ceftriaxone use.
- Authors conclude that global reduction of ceftriaxone use will be guided by local epidemiology and availability of reliable and affordable tests.

*Lancet Microbe* | Scientific article | 4 July 2023 | [Online link](#)

### Impact of antibiotics on gut microbiome composition and resistome in the first years of life in low- to middle-income countries: a systematic review

- Review indicates that antibiotic use reduces gut microbe diversity and increases risk of resistant infections among children.
- Recommends more research on impact of commonly consumed antibiotics on microbiome and child health.

*PLoS Medicine* | Systematic review | 27 June 2023 | [Online link](#)

### Collateral impacts of pandemic COVID-19 drive the nosocomial spread of antibiotic resistance: a modelling study

- Evaluated impact of COVID-19 outbreaks on spread of multi-drug resistant bacteria (MRB) in hospital settings, which showed that nosocomial COVID-19 surges led to selection and spread of MRB.
- Timely implementation of COVID-19 precautions prevented transmission of COVID-19 and MRBs, highlighting the collateral benefit of pandemic preparedness.

*PLoS Medicine* | Research article | 5 June 2023 | [Online link](#)

### Phytochemicals as antimicrobials: prospecting Himalayan medicinal plants as source of alternate medicine to combat antimicrobial resistance

- Reviews potential of phytochemicals and 123 Himalayan plants as antimicrobial compounds.
- Compiles existing information to aid research on phytochemicals as novel antimicrobials.

*Pharmaceuticals* | Research article | 15 June 2023 | [Online link](#)

### Profiling of antimicrobial resistance genes and integron from *Escherichia coli* isolates using whole genome sequencing

- Reports higher number of AMR genes in *E. coli* isolates from healthy chickens compared to diseased chickens.
- Class 1 integrons were also detected among all isolates, which play an important role in the transfer of AMR genes between pathogenic bacteria and normal flora of the animals.

*Genes* | Research article | 1 June 2023 | [Online link](#)

## Efflux pump-binding 4(3-aminocyclobutyl)pyrimidin-2-amines are colloidal aggregators

- Aimed to identify analogs with enhanced affinity for specific targets, to act synergistically with antibiotics.
- Despite synergy with erythromycin, these were not suitable for further development as they form colloidal aggregates that impact their binding to proteins.

*Biomolecules* | Research article | 16 June 2023 | [Online link](#)

## Integrative digital tools to strengthen data management for antimicrobial resistance surveillance in the “One Health” domain in Nepal

- Describes digital tools developed in Nepal to improve efficiency and accuracy of AMR sentinel surveillance in human and animal institutions, which could be extended to the environment sector.

*Tropical Medicine and Infectious Disease* | Project report | 25 May 2023 | [Online link](#)

### Strategic priority 6: Collaborations

## A One Health priority research agenda for antimicrobial resistance

- Quadripartite AMR research agenda aims to catalyse research in AMR with a One Health perspective.
- It has 5 pillars – transmission, integrated surveillance, interventions, behavioural insights and change, and economics and policy – which are enriched by cross-cutting themes of gender, vulnerability and sustainability.

*WHO-FAO-UNEO-WOAH* | Publication | 3 July 2023 | [Online link](#)

## Future directions for One Health research: regional and sectoral gaps

- Assessment of abstracts submitted in the first and sixth World One Health Congresses reveals increasing attention to AMR and increased global participation in One Health research.
- Highlights regional differences in research priorities, with high human development index (HDI) countries focused on public policy, while medium and low HDI countries focus on disease surveillance.

*One Health* | Research article | 19 June 2023 | [Online link](#)

## Evidence for the transmission of antimicrobial resistant bacteria between humans and companion animals: a scoping review

- Reviews preliminary evidence on bi-directional transmission of AMR between humans and pets.
- Rigorous study designs are required to systematically document transmission.

*One Health* | Review article | 29 June 2023 | [Online link](#)

## Quotable quote

***AMR is a silent and invisible pandemic that cannot be overshadowed by other competing public health priorities***

– Dr Bharati Pravin Pawar,  
Union Minister of State for Health & Family Welfare, Government of India

*\*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.