



Antimicrobial Resistance (AMR)

Last Updated: August 2022

For Prelims: Antimicrobial Resistance (AMR), New Delhi Metallo-beta-lactamase-1 (NDM-1), Antibiotic Stewardship Program (AMSP), Steps Taken to Prevent the AMR, One Health Approach.

For Mains: Antimicrobial Resistance (AMR) - concerns regarding AMR, challenges to preventing AMR, Government's initiatives to Prevent AMR.

Why in News?

- In the past few years, alarmingly **high resistance rates in pathogens** of public health importance have been reported from Indian hospitals. The Covid-19 pandemic has also raised concerns about the improper use of antimicrobials amongst Covid-19 patients.
 - The **unnecessary prescription of antimicrobials** amid the Covid-19 pandemic, **unsustainable use of antibiotics** and the **discharge of untreated effluents and wastewater into water systems** has led to an increase in the already high levels of drug resistance in most parts of the world.

What is Antimicrobial Resistance?

- **Antimicrobial Resistance** is the resistance acquired by any microorganism (bacteria, viruses, fungi, parasite, etc.) against antimicrobial drugs that are used to treat infections.
 - It **occurs when a microorganism changes over time and no longer responds to medicines** making infections harder to treat and increasing the risk of disease spread, severe illness and death.
 - The **World Health Organisation (WHO)** has identified **AMR as one of the top ten threats to global health**.
- Microorganisms that develop antimicrobial resistance are sometimes referred to as **"superbugs"**.
- In India, over **56,000 newborn deaths each year due to sepsis** caused by organisms that are resistant to first line antibiotics.
- A study reported by **ICMR (Indian Council of Medical Research)** from 10 hospitals showed that **when Covid patients acquire drug-resistant infections in hospitals, the mortality is almost 50-60%**.
- The multi-drug resistance determinant, **New Delhi Metallo-beta-lactamase-1 (NDM-1)**, emerged from this region.
 - Africa, Europe and other parts of Asia have also been affected by multi-drug resistant typhoid originating from South Asia.

What are the Concerns Regarding AMR?

- **Life-threatening Condition:** The growth of AMR has proved to be a **major challenge in the treatment of sepsis**, which is a life-threatening condition and, unfortunately, the failure of antibiotics is **leading to deaths which are preventable**.

- **Reduction in Medical Advances:** AMR is also **undermining and undoing medical advances made over decades**, especially for high-burden diseases like [tuberculosis](#) and various cancers.
- **Achievements of Goals:** It is putting the gains of the Millennium Development Goals at risk and **endangers achievement of the [Sustainable Development Goals](#)**.
- Increase in Superbugs: Untreated wastewater from medical facilities is awash with chemical compounds that **promote superbugs**.
- **Expanding with Time:** The concoction of **self-medication and over the counter (OTC) antibiotic availability** has led to one of the **highest rates of antibiotic resistance** in the world.

What are the Reasons for the Spread of AMR?

- **Antibiotic consumption in humans**
 - Unnecessary and injudicious use of antibiotic fixed dose combinations could lead to emergence of bacterial strains resistant to multiple antibiotics.
- **Social factors**
 - Include self-medication.
 - Access to antibiotics without prescription.
 - Lack of knowledge about when to use antibiotics.
- **Cultural Activities**
 - Mass bathing in rivers as part of religious mass gathering occasions.
- **Antibiotic Consumption in Food Animals**
 - Antibiotics which are critical to human health are commonly used for growth promotion in poultry.
- **Pharmaceutical Industry Pollution**
 - The wastewater effluents from the antibiotic manufacturing units contain a substantial amount of antibiotics, leading to contamination of rivers and lakes.
- **Environmental Sanitation**
 - Untreated disposal of sewage water bodies - leading to contamination of rivers with antibiotic residues and antibiotic-resistant organisms.
- **Infection Control Practices in Healthcare Settings**
 - A report on hand-washing practices of nurses and doctors found that only 31.8% of them washed hands after contact with patients.

AMR in India: What's the Scenario?

- AMR is of particular **concern in developing nations**, including India, where the burden of infectious disease is high and healthcare spending is low.
 - India is among the nations with the highest burden of bacterial infections.
- Consequently, the impact of AMR is **likely to be higher in the Indian setting**.
- The [National Health Policy 2017](#) highlights the problem of antimicrobial resistance and calls for effective action to address it.
- The Ministry of Health & Family Welfare (MoHFW) identified AMR as **one of the top 10 priorities** for the ministry's collaborative work with the [World Health Organisation \(WHO\)](#).
- India has instituted **surveillance of the emergence of drug resistance in disease causing microbes** in programmes on Tuberculosis, Vector Borne diseases, AIDS, etc.
- Since March 2014 a separate Schedule H-1 has been incorporated in Drug and Cosmetic rules to regulate the sale of antimicrobials in the country.
- The [Food Safety and Standards Authority of India \(FSSAI\)](#) banned the use of antibiotics and several pharmacologically active substances in fisheries.
- The government has also capped the maximum levels of drugs that can be used for growth promotion in meat and meat products.
- India, with its combination of large population, rising incomes that facilitate purchase of antibiotics, **high burden of infectious diseases and easy over-the-counter access to antibiotics**, is an important locus for the generation of resistance genes (such genes help bacteria in surviving on being exposed to antibiotics).
- The multi-drug resistance determinant, **New Delhi Metallo-beta-lactamase-1 (NDM-1)**, emerged from this region to spread globally.
 - Africa, Europe and other parts of Asia have also been **affected by multi-drug resistant**

typhoid originating from South Asia.

- In India, over 56,000 newborn deaths each year due to sepsis are caused by organisms that are resistant to first line antibiotics.
- A study reported by [ICMR \(Indian Council of Medical Research\)](#) from 10 hospitals showed that when Covid patients acquire drug-resistant infections in hospitals, the mortality is almost 50-60%.
- According to the **Global Research on Antimicrobial Resistance (GRAM) report**, 1.27 million people died in 2019 as a direct result of AMR (Antimicrobial Resistance).
- The death due to AMR is now a leading cause of death worldwide, **higher than [HIV/AIDS](#) or [malaria](#)**.
- Most of the deaths from AMR were **caused by lower respiratory infections**, such as pneumonia, and bloodstream infections, which can lead to sepsis.
 - MRSA (Methicillin-Resistant Staphylococcus Aureus) was particularly deadly, while E. coli, and several other bacteria, were also linked to high levels of drug resistance.

What are the Impacts?

- **A threat to prevention and treatment of infections** - medical procedures such as organ transplantation, cancer chemotherapy, diabetes management and major surgery (for example, caesarean sections or hip replacements) become very risky.
- The **failure to treat infections caused by resistant bacteria** also poses a greater risk of death.
- Antimicrobial resistance **increases the cost** of health care with lengthier stays in hospitals, additional tests and use of more expensive drugs.
- Without effective antibiotics for prevention and treatment of infections, the achievements of modern medicine are put at risk.
- Without urgent action, **the world is heading to antibiotic apocalypse** - a future without antibiotics, with bacteria becoming completely resistant to treatment and when common infections and minor injuries could once again kill.
- Antimicrobial resistance is putting the gains of the **Millennium Development Goals at risk** and **endangers** achievement of the Sustainable Development Goals.

What are the Challenges Related to Preventing AMR?

- **Inadequate Information Systems:** The resistance rates reported by the hospitals and laboratories **do not automatically translate to disease burden** unless each resistant isolate is correlated with the clinical outcomes in the patients from whom they were isolated.
 - This has to do with **inadequate hospital information systems** in most public sector funded healthcare facilities in India and many low-middle income countries.
- **Insufficient Fundings: No new classes of antibiotics have made it to the market** in the last three decades, largely on account of **inadequate incentives** for their development and production.
 - Lack of an urgent action is leading towards an **antibiotic apocalypse** - a future with bacteria becoming completely resistant to treatment.
- **Exclusion of Antibiotic Residues:** In India, **current effluent standards do not include antibiotic residues**, and thus they are **not monitored** in the pharmaceutical industry effluents.
- **Inefficiency of Schemes:** The National Action Plan for AMR, approved in 2017, completes its official duration this year. The **progress under the plan has been far from satisfactory**.
 - Too many players, **missing governance mechanisms** and **absence of funding** are the key impediments to the effective rollout of the scheme.
- **Underreporting in GRAM Report:** Only a fraction of the Indian data, available through the [WHO-GLASS portal](#), has been included in the GRAM report.
 - India has been reporting **high levels of resistance to fluoroquinolones, cephalosporins and carbapenems** across the Gram-negative pathogens that cause almost **70% of infections in communities and hospitals**.

What are the Initial Steps to fight against AMR?

- Infection control in healthcare facilities.

- Creating awareness about the use and abuse of antibiotics.
- Vaccination can combat drug resistance by reducing the cases of infection and as a result reducing the need for antibiotics.
- Strengthening resistance tracking so that data on antimicrobial resistant infections and causes of infection can be gathered to enable formulation of specific strategies to prevent the spread of the resistant bacteria.
- Self-medication should be shunned.
- Antibiotics should be used only when prescribed by the doctor.
- Appropriate and safe use of antibiotics- taking antibiotics only when needed, choosing the right antibiotic and completing the full prescription.
- Invest in the search for new antibiotics to keep up with resistant bacteria as well as in new diagnostic tests to track the development of resistance.

What Initiatives have been taken to Prevent AMR?

- **National Programme on AMR containment:** Launched in 2012. Under this programme, AMR Surveillance Network has been strengthened by establishing labs in State Medical College.
- **National Action Plan on AMR:** It focuses on [One Health approach](#) and was launched in April 2017 with the aim of involving various stakeholder ministries/departments.
- **AMR Surveillance and Research Network (AMRSN):** It was launched in 2013, to generate evidence and capture trends and patterns of drug resistant infections in the country.
- **AMR Research & International Collaboration:** [Indian Council of Medical Research \(ICMR\)](#) has taken initiatives to develop new drugs /medicines through international collaborations in order to strengthen medical research in AMR.
 - ICMR **along with the Research Council of Norway (RCN)** initiated a joint call for research in antimicrobial resistance in 2017.
 - ICMR along with the Federal Ministry of Education and Research (BMBF), Germany has a joint Indo-German collaboration for research on AMR.
- **Antibiotic Stewardship Program:** ICMR has initiated [Antibiotic Stewardship Program \(AMSP\)](#) on a pilot project across India to control misuse and overuse of antibiotics in hospital wards and ICUs.
 - DCGI had **banned 40 Fixed Dose Combinations (FDCs)** which were found inappropriate.

What are the Global Measures?

- **World Antimicrobial Awareness Week (WAAW):**
 - Held annually since 2015, WAAW is a global campaign that **aims to raise awareness of antimicrobial resistance worldwide** and encourage best practices among the general public, health workers and policy makers to slow the development and spread of drug-resistant infections.
- **The Global Antimicrobial Resistance and Use Surveillance System (GLASS):**
 - WHO launched the GLASS in 2015 to continue filling knowledge gaps and to inform strategies at all levels.
 - GLASS has been **conceived to progressively incorporate data** from surveillance of AMR in humans, surveillance of the use of antimicrobial medicines, AMR in the food chain and in the environment.

What can be the Way Forward?

- **Multipronged Strategy for Reducing AMR:** Addressing AMR requires a multipronged and multisectoral approach. The urgency to develop new drugs should not discourage us from **instituting measures to use the existing antimicrobials judiciously.**
 - **Improved infection control** in communities and hospitals, **availability and utilisation of quality diagnostics** and laboratories and **educating people about antimicrobials** have proved effective in reducing antimicrobial pressure — a precursor to resistance.
 - All this requires a **comprehensive plan, driven by a designated coordinating agency** backed with suitable funding.

- **One Health Approach:** AMR has the potential to return the world to a pre-antibiotic era when medicines could not treat even simple infections.
 - Therefore, to contain AMR, there is need for a **One Health Approach** through **coherent, integrated, multi sectoral cooperation** and actions, as human, animal and environmental health are integrated.
 - **Development of antibiotic resistance breakers (ARBs)** to restore effectiveness of older classes of antibiotics.
- **Effective Surveillance and Data Management:** It is time to adopt strategies for optimising use of antibiotics across disciplines and exercise prudence across the board including in **pharmaceutical effluent discharge**.
 - **Effective microbiological surveillance** of the agriculture and livestock industry and pharmaceutical manufacturing plants would allow for **informed policy actions to mitigate AMR**.
 - Promoting research to **address the data deficiency around AMR for evidence-based assessment and intervention** will further assist in this fight.

UPSC Civil Services Examination Previous Year's Question (PYQs)

Q. Which of the following are the reasons for the occurrence of multi-drug resistance in microbial pathogens in India? (2019)

1. Genetic predisposition of some people
2. Taking incorrect doses of antibiotics to cure diseases
3. Using antibiotics in livestock farming
4. Multiple chronic diseases in some people

Select the correct answer using the code given below.

- (a)** 1 and 2
- (b)** 2 and 3 only
- (c)** 1, 3 and 4
- (d)** 2, 3 and 4

Ans: (b)