Antibiotic resistance is not a problem that can be solved by any one country or even one region. Since, we live in a connected world, where people, animals and food travel and microbes travel with them, a global action is essential to make progress in the long run. Increasing public awareness and understanding is therefore the most crucial pillar towards tackling antimicrobial resistance. AMR is an increasingly serious threat to the global public health that requires action across all government sectors and societies.

**What is Antimicrobial resistance?**

Antimicrobial resistance (AMR or AR) is the ability of a microbe to resist the effects of medication that once could successfully treat the microbe. The term antibiotic resistance is a subset of AMR, as it applies only to bacteria becoming resistant to antibiotics. Antibiotics are medicines used to prevent and treat bacterial infections. Antibiotic resistance occurs when bacteria change in response to the use of these medicines.

Bacteria, not humans or animals, become antibiotic-resistant. These bacteria may infect humans and animals, and the infections they cause are harder to treat than those caused by non-resistant bacteria. Antibiotic resistance occurs naturally, but misuse of antibiotics in humans and animals is accelerating the process. A growing number of infections – such as pneumonia, tuberculosis, gonorrhoea, and salmonellosis – are becoming harder to treat as the antibiotics used to treat them become less effective. It leads to higher medical costs, prolonged hospital stays, and increased mortality.

**PT PICKS:** *Antimicrobial resistance (AMR)* is the ability of a microorganism (like bacteria, viruses, and some parasites) to stop an antimicrobial (such as antibiotics, antivirals and antimalarials) from working against it. As a result, standard treatments become ineffective, infections persist and may spread to others.

When an organism is resistant to more than one drug, it is said to be multidrug-resistant.

**Key findings:**

1. India is one of the top users of antibiotics.
2. The private sector clocked high levels of antibiotic prescription rates (412 per 1,000 persons per year).
3. The highest rate was seen among children aged 0–4 years (636 per 1,000 persons) and the lowest in the age group 10–19 years (280 per 1,000 persons).
4. Per-capita antibiotic consumption in the retail sector has increased by around 22% in five years from 2012 to 2016.

**Ways by which individuals become antibiotic resistant** (2019 PT)
- Inappropriate use of antibiotics such as popping pills for mild ailments like common cold.
- Rampant use of antibiotics in livestock and poultry animals. Antibiotics used in animals to treat infections and for growth promotion are often passed on to humans who consume their meat.
- Improper disposal of residual antibiotics that eventually enter the food chain.
- Prolonged illness
- Poor diagnosis
- Poor health and hygiene management in Hospitals (Fluid exchange)
- Globalisation

Doctors’ take on antibiotics

- Doctors believe that the inappropriate and sometimes rampant use of antibiotics has transformed the healthy human intestinal gut flora into a reservoir of antibiotic resistance organisms.
- At present organisms are resistant to low end antibiotics but if the misuse persists, these may become resistant to high end antibiotics as well.
- There are as many bacteria in a human body as the number of cells. They perform a host of functions to keep the body running for example, processing the food we eat and modulating the immune system. The antibiotic resistant bacteria aren’t healthy so they cannot perform these functions well.
- The presence of antibiotic resistance in healthy individuals is a cause for concern because it signals that it will get more difficult to treat infections in the future.

India’s action plan for AMR

- A national policy for containment of AMR was introduced in 2011. The policy aims to understand emergence, spread and factors influencing AMR.
- To set up an antimicrobial program to rationalize use of antimicrobials and to encourage the innovation of newer and effective antimicrobials.
- In addition, some major action points identified in the national policy are:
  - Establishing an AMR surveillance system.
  - To strengthen infection, prevention and control measures.
  - Educate, train and motivate all stakeholders in the rational use of antimicrobials.
  - Providing sanitation, clean water and good governance.
  - Increasing public health expenditure and better regulating the private health sector.

WHO’s take on antibiotic resistance

- As per the World Health Organization (WHO), antibiotic resistance is rising to dangerously high levels in all parts of the world.
- The alarming rate at which bacteria are becoming resistant has led the World Health Organization (WHO) to identify AMR as one of the top ten threats to global health.
- The world body recommends that countries must prioritize their national action plans to scale up financing and capacity building efforts, put in place a stronger regulatory systems and support awareness programmes for responsible and prudent use of antimicrobials by professionals in humans, animals and plants health.
- In addition, countries must invest in ambitious research and development technologies to combat AMR.
- The WHO also suggests a number of steps that can be taken at various levels to reduce
the impact and also limit the spread of this resistance.

At individual level

- For individuals, the most important step towards preventing and controlling the spread of this antibiotic resistance is to use antibiotics only when prescribed by a certified health professional. Also, never sharing with anyone used leftover antibiotic.
- Preparing food hygienically and avoiding close contact with sick people.
- Practising safer sex and keeping vaccinations up to date.
- Following the WHO’s five keys to safer food i.e. to keep clean, separate raw and cooked, cook thoroughly, keep food at safe temperatures, use safe water and materials and choose foods that have been produced without the use of antibiotics for growth promotion or disease prevention in healthy animals.

For Policymakers

- Policymakers must ensure that a robust national action plan is in place to tackle antibiotic resistance.
- Surveillance of antibiotic-resistant infections must be improved.
- Policies, programmes and implementation of infection prevention and control measures must be strengthened.
- It is required to regulate and promote the appropriate use of quality medicines.
- Information must also be made available on the impact of antibiotic resistance.

For Health Professionals

- Health professionals need to play a major role in preventing and controlling the spread of antibiotic resistance.
- The first and foremost thing that must be done is to ensure that their hands, instruments and environment are clean.
- They should only prescribe and dispense antibiotics when they are needed.
- They must immediately report antibiotic resistant infections to surveillance teams.

For different sectors

- Sectors like healthcare and agriculture must also act to prevent and control the spread of antibiotic resistance.
- The healthcare industry can invest in research and development of new antibiotics, vaccines, diagnostics and other tools.
- The agricultural sector must adhere to the guidelines such as giving antibiotics to animals only under veterinary supervision.
- Antibiotics should not be used for growth promotion or to prevent diseases in healthy animals.
- Animals must be vaccinated to reduce the need for antibiotics and use alternatives to antibiotics when available.
- The agriculture sector should also promote and apply good practices at all steps of production and processing of food from animals and plants sources.
- In addition, they must also improve biosecurity on farms and prevent infections through improved hygiene and animal welfare.
RECENT STRATEGIES:

1. In 2015, WHO launched the global antimicrobial surveillance system (GLASS) to work closely with WHO collaborating centres and existing antimicrobial resistance surveillance networks.
   
   - As members of GLASS, countries are encouraged to implement the surveillance standards and indicators gradually based on their national priorities and available resources.

2. Recently, the United Nations (UN) has begun considering the threat of antimicrobial resistance (AMR) to be at par with diseases like ebola, HIV.

3. The WHO has launched a global campaign that urges countries to adopt its new online tool aimed at guiding policy-makers and health workers to use antibiotics safely and more effectively.

   AWARE Tool

   The tool, known as ‘AWaRe’, classifies antibiotics into three groups:

   Access — antibiotics used to treat the most common and serious infections
   Watch — antibiotics available at all times in the healthcare system
   Reserve — antibiotics to be used sparingly or preserved and used only as a last resort

4. India has been called the epicenter of the global drug resistance crisis. Chickens in numerous poultry farm are being given Colistin, to protect them against diseases or to make them gain weight faster. Doctors call Colistin the ‘last hope’ antibiotic.

   The World Health Organisation has called for the use of such antibiotics to be restricted to animals. These should be banned as growth promoters.

   MCR-1 is one such gene discovered recently. It could be transferred within and between species of bacteria. This means that microbes did not have to develop resistance themselves, they could become resistant just by acquiring the MCR-1 gene. The resistance could be passed to bugs which are already multi-drug resistant. This could lead to untreatable infections. Another such gene is New Delhi Metallo-beta-lactamase 1 (NDM-1), which makes bugs resistant to carbapenem antibiotics.

5. 2017 National Action Plan on Antimicrobial Resistance

   1. For the first time, the 2017 National Action Plan on Antimicrobial Resistance talks about
limiting antibiotics in effluent being dumped by drug makers into the environment
2. This is because when these drugs taint soil and water, the scores of microbes that live there grow drug-resistant
3. Until now, India’s fight against antibiotic-resistance was focussed on getting people to cut down on unnecessary antibiotic consumption

Why is resistance among microbes a problem?

1. The answer lies in the intimacy shared between environmental bacteria and human pathogens
2. A pathogen, say Klebsiella pneumoniae (K. pneumoniae), that causes pneumonia, can take two routes to antibiotic resistance
3. The first is for its own genes to mutate spontaneously to help fight the drug
4. The second route, a shortcut known as horizontal gene transfer, is for the bug to borrow resistance genes from its neighbours
5. Scientists believe that many human pathogens today picked up their resistance genes from the environment through this shortcut

Phenomenon of anti-microbial resistance not new

1. Phylogenetic studies suggest that the earliest antibiotic-resistance genes in nature are millions of years old
2. But when humans started manufacturing antibiotics in the 1950s, a dramatic shift occurred
3. Large doses of these drugs seeped into the environment through poultry and human excreta, and waste water from drug makers and hospitals
4. This led to an explosion of resistance genes in soil and water microbes

6. European project ANSWER

It stands for ‘Antibiotics and mobile resistance elements in wastewater reuse applications: risks and innovative solutions’. This project studies technologies to remove antibiotic-resistance germs from wastewater along with other research.

6. India’s Red line campaign: (launched in Feb 2016) is finding recognition, and could be adopted globally. It should be considered as starting point of restriction over use of antibiotics.

Aim: To decrease the use of Red line antibiotics without prescription, create awareness of danger of taking antibiotics.

7. Recently, India has joined the Global Antimicrobial Resistance (AMR) Research and Development (R&D) Hub as a new member.

- Working with AMR(R&D) Hub would help India to expand existing capabilities, resources and collectively focus on new R&D intervention to address drug-resistant infections present in the country.
- Global Antimicrobial Resistance (AMR) Research and Development (R&D) Hub is a collaboration of 16 countries, the European Commission, two philanthropic foundations
and four international organizations (as observers).

- It was launched in 2018 during the 71st session of the World Health Assembly, following a call from G20 Leaders in 2017.
- It is supported through a Secretariat, established in Berlin, Germany.
- It aims to further improve the coordination of international efforts and initiatives to tackle Antimicrobial Resistance while further increasing investments into R&D for AMR.
- The work of the Global AMR R&D Hub will be aligned to the priorities set by
  - World Health Organization (WHO)
  - Food and Agriculture Organization of the United Nations (FAO)
  - World Organisation for Animal Health (OIE).
- It enforces the One Health Approach by including environmental aspects and veterinary medicine against antimicrobial resistance.
- It integrates human and animal health, worldwide food safety and environmental factors.