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In Depth – Drug Resistance

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Whenever one suffers a severe infection, medical practitioners prescribe antibiotics to help one fight the infection caused by bacteria. **Also known as antimicrobial drugs, antibiotics have saved countless lives since 1928 - when penicillin, the first antibiotic, was used by doctors.** But, over the years, **the misuse and overuse of these drugs has contributed to a phenomenon known as antibiotic resistance.** This resistance develops when a potentially harmful bacteria changes in a way that reduces or eliminates the effectiveness of antibiotics.

Concerns

- The world is heading rapidly towards a post-antibiotic era, in which common infections will once again kill. As per a UN report, at least 7,00,000 people die each year due to drug-resistant diseases currently. By 2050, this number could go up to 10 million.

- In India too, a recent study states that two out of every three healthy Indians are resistant to two major types of antibiotics. A study published by the Indian Council of Medical Research (ICMR) has found antibiotic resistant organisms in the digestive tracts of two out of every three healthy persons that it tested, pointing to a rapid spread of antibiotic resistance in the Indian population.

Antibiotics

- Antibiotics are remarkable drugs capable of killing biological organisms in one's body without harming the body.
- These are used for everything from preventing infections during surgeries to protecting cancer patients undergoing chemotherapy.
- **India is the world's largest consumer of antibiotics.** India's excessive antibiotic usage is leading to a powerful never before seen mutation within bacteria.
- **Drug resistance happens when one overuses antibiotics in the treatment of humans, animals as well as plants.**

When a new antibiotic is introduced, it can have great, even life saving results but only for sometime. After that, the bacteria adapts and gradually the antibiotics become less effective.
- **Antibiotic resistance has the potential to affect people at any stage of life.** When a person is infected with antibiotic resistant bacteria, not only the treatment of that patient becomes difficult, but antibiotic resistant bacteria may spread to other people as well.
- When antibiotics do not work, the situation may lead to more complicated diseases, the use of stronger and expensive drugs and gradually more deaths caused by bacterial infections.
- The spread of antibiotic resistance worldwide is undermining decades of progress in fighting bacterial infections. **A recent example to take into account is the emergence of the drug resistant tuberculosis.** According to the World Health Organization (WHO) in 2017, around 6 lakh cases globally were resistant to the most effective first line drug and 82% of these people had multidrug resistant TB.
- New resistant mechanisms are emerging and spreading globally, threatening the ability to treat common infectious diseases resulting in prolonged illness, disability and even death.

Antimicrobial Resistance

- **The term antibiotic resistance is a subset of antimicrobial resistance or AMR which is the ability of a microbe to resist the effects of medication.**
- **Antimicrobial resistant-microbes** occur naturally and are found in people, animals, food, and the environment (in water, soil and air). **They can spread between people and animals, including from food of animal origin, and from person to person.**

- AMR is **facilitated by the inappropriate use of medicines**, for example, using antibiotics for viral infections such as the flu.
- Inadequately treated sewage waste containing resistant bacteria which mixes in the environment also magnify the burden of AMR.
- Poor infection control, inadequate sanitary conditions and inappropriate food handling encourage the spread of AMR.
- **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.

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

Findings from the ICMR Study (India)

- The study is based on the analysis of stool samples of 207 individuals who had not taken any antibiotic for at least a month and did not suffer from any chronic illness.
- **The study found that 139 individuals were resistant to one or more class of antibiotics.**
- The maximum resistance was seen for cephalosporins (60%) followed by fluoroquinolones (41.5%), two commonly used antibiotics.
- Only 2% of the individuals were found to be multidrug resistant.

Ways by which individuals become antibiotic resistant

- **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.**

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.**

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.