

# ANTI-MICROBIAL RESISTANCE



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**By**

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## **INTRODUCTION:**

Antimicrobial resistance (AMR) refers to the ability of microorganisms, such as bacteria, viruses, fungi, and parasites, to resist the effects of antimicrobial drugs. This can occur when microorganisms adapt to antimicrobial drugs therapeutic effect over time, making them less effective or completely ineffective.

AMR is a growing public health concern worldwide, as it can lead to longer hospital stays, higher healthcare costs, and increased mortality rates. It can also result in the loss of effective treatments for infectious diseases, which can have serious concern for global health and development.

## **CAUSES/ETIOLOGY:**

- **Overuse and misuse of antibiotics:** Overprescribing and the use of antibiotics in animal husbandry and agriculture can contribute to the development of resistance.
- **Poor infection prevention and control:** Poor hygiene practices, inadequate sanitation, and poor infection control measures can allow resistant organisms to spread.
- **Lack of access to clean water and sanitation:** People who lack access to clean water and sanitation are at higher risk of contracting infections, which increases the likelihood of antibiotic use.
- **International travel and migration:** Travel and migration can facilitate the spread of resistant organisms across borders.
- **Insufficient new drug development:** There has been a decline in the development of new antibiotics in recent years, which means that existing antibiotics are overused, leading to the development of resistance.
- **Climate change:** Changes in climate and the environment can create new conditions for the spread of infections and the development of resistance.
- **Genetics:** Some people may have genetic factors that make them more susceptible to developing resistance.

## **PATHOGENESIS:**

Antimicrobial resistance (AMR) develops in the body when microorganisms such as bacteria, viruses, fungi, and parasites adapt and alter the response to antimicrobial drugs. The development of resistance can occur through various mechanisms, including:

1. **Mutation:** Microorganisms can develop mutations that they can survive in the presence of antimicrobial drugs.
  - Microorganisms such as bacteria, viruses, fungi, and parasites undergo changes in their genetic material. These mutations can occur naturally or as a result of exposure to antimicrobial drugs.
  - When a microorganism is exposed to an antimicrobial drug, the drug targets specific components or processes within the microorganism to either kill it or inhibit its growth. However, if a mutation occurs in the microorganism's genetic material, it may alter the target site or the metabolic pathway that the drug targets, making the drug ineffective.
  - Mutation may also increase the microorganism's ability to pump out the drug or break it down, reducing its effectiveness.
2. **Horizontal gene transfer:** Microorganisms can exchange genetic material, including genes that confer resistance, through processes such as conjugation, transformation, and transduction.
3. **Selection pressure:** The use of antimicrobial drugs creates selective pressure that favors the survival and growth of resistant microorganisms.

Once a microorganism has developed resistance, it can replicate and spread, making it more difficult to treat infections. The development of resistance can also lead to the emergence of superbugs, which are strains of microorganisms that are resistant to multiple antimicrobial drugs.

## **CLINICAL MENIFESTATION/SIGN & SYMPTOMS:**

The symptoms of an infection caused by antimicrobial-resistant microorganisms will depend on the type of microorganism and the part of the body affected. In general, some common symptoms of infections caused by resistant microorganisms may include:

1. Fever
2. Pain or discomfort in the affected area
3. Redness, swelling, or inflammation
4. Cough or difficulty breathing
5. Fatigue or weakness
6. Nausea, vomiting, or diarrhea
7. Headache or body aches

## **DIAGNOSIS:**

1. Physical examination & Medical history.
2. Culture and sensitivity testing: This involves taking a sample of the infected tissue or fluid and growing it in a laboratory culture to identify the microorganism causing the infection. Sensitivity testing is then done to determine which antimicrobial drugs are effective against the microorganism.
3. Polymerase chain reaction (PCR) testing: PCR can be used to identify the presence of specific genes associated with antimicrobial resistance in microorganisms.
4. Imaging tests: Imaging tests such as X-rays, computed tomography (CT), or magnetic resonance imaging (MRI) can be used to evaluate the extent of infection and its effects on the body.

5. Blood tests: Blood tests can help identify the presence of infection, monitor the body's response to treatment, and detect signs of inflammation or other abnormalities.

## **PHARMACOLOGICAL MANAGEMENT:**

Healthcare providers use a range of antimicrobial drugs, including antibiotics, antivirals, antifungals, and anti-parasitics. The choice of drug will depend on the type of microorganism causing the infection, as well as the severity and location of the infection.

- **Beta-lactam antibiotics:** This class includes penicillins, cephalosporins, and carbapenems, which target bacterial cell walls. Resistance to beta-lactam antibiotics is common among many bacteria.
- **Macrolides:** Macrolides, such as azithromycin and erythromycin, are commonly used to treat respiratory and soft tissue infections caused by bacteria. However, resistance to macrolides is increasing, particularly among *Streptococcus pneumoniae* and *Staphylococcus aureus*.
- **Quinolones:** Quinolones, such as ciprofloxacin and levofloxacin, are broad-spectrum antibiotics that target bacterial DNA synthesis. However, resistance to quinolones is increasing, particularly among Gram-negative bacteria such as *Escherichia coli*.
- **Antifungals:** Antifungal drugs, such as fluconazole and amphotericin B, are used to treat fungal infections. However, resistance to antifungals is increasing, particularly among *Candida* species.
- **Antivirals:** Antiviral drugs, such as acyclovir and oseltamivir, are used to treat viral infections such as influenza and herpes.

However, resistance to antivirals is increasing, particularly among influenza viruses.

### **NON PHARMACOLOGICAL MANAGEMENT:**

- Prescribing antibiotics only when necessary and appropriate.
- Using the most effective antimicrobial drugs for specific infections.
- Completing the full course of antibiotics as prescribed.
- Taking steps to prevent the spread of infections, such as washing hands frequently, practicing good hygiene, and using personal protective equipment when appropriate.
- Supporting the development of new antimicrobial drugs and alternative therapies.