

Definition, etiopathogenesis, clinical manifestations, nonpharmacological and pharmacological management of the diseases associated with Anti-microbial Resistance

Anti-Microbial Resistance (AMR)

Definition:

- Antimicrobial resistance (AMR) occurs when microorganisms evolve mechanisms to survive exposure to antimicrobial drugs, rendering standard treatments ineffective.

Etiopathogenesis:

Mechanisms of Resistance:

1. **Enzymatic degradation** of the drug (e.g., beta-lactamase)
2. **Alteration of drug target site** (e.g., MRSA's altered penicillin-binding protein)
3. **Efflux pumps** (actively remove drug from cell)
4. **Reduced permeability** (changes in porins)
5. **Biofilm formation** (protects bacteria from drugs and immune system)

Causes of AMR:

- Overuse and misuse of antibiotics (e.g., for viral infections)
- Incomplete antibiotic courses
- Over-the-counter access without prescription
- Use of antibiotics in agriculture and animal husbandry
- Poor infection control in hospitals
- Lack of new antibiotic development

Clinical Impact:

- Increased morbidity and mortality from once-treatable infections
- Longer hospital stays
- Higher healthcare costs
- Rise of **superbugs**: MRSA, VRE, CRE, XDR-TB
- Loss of effective treatments for surgical and immunocompromised patients

Non-Pharmacological Strategies to Combat AMR:

1. **Antibiotic stewardship programs** in hospitals
2. **Public awareness campaigns** on responsible use
3. **Improved infection control** (hand hygiene, sterilization)
4. **Vaccination** to reduce infection burden
5. **Sanitation and clean water access**
6. **Surveillance systems** to track resistance trends

Pharmacological & Policy Approaches:

- Restrict use of last-resort antibiotics (e.g., colistin)
- Develop new antibiotics and alternative therapies (e.g., bacteriophage therapy, immunotherapy)
- Global action plans (e.g., WHO's Global Action Plan on AMR)
- Combination therapies to prevent resistance development
- Research on host-directed therapies and resistance breakers



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