Antimicrobial Resistance in India

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Antimicrobial Resistance in India: Challenges, Impacts, and the Road Ahead

Context:

A **recent global study** funded by **Wellcome** and the **UK Department of Health and Social Care's Fleming Fund** estimates that **bacterial AMR alone could cause 39 million (3.9 crore) deaths between 2025 and 2050** — equivalent to **three deaths every minute**. This alarming projection highlights AMR as a serious global public health threat, especially for countries like India where antibiotic misuse and infectious diseases are prevalent.

What is Antimicrobial Resistance (AMR)?

- **Antimicrobials**: Medications like **antibiotics, antivirals, antifungals, and antiparasitics** used to treat infections in humans, animals, and plants.

- **AMR**: Occurs when microorganisms (bacteria, viruses, fungi, parasites) evolve to resist antimicrobial agents they were previously sensitive to.

AMR in India:

- Resistance has been detected in key pathogens like **E. coli, Klebsiella, Acinetobacter, Staphylococcus aureus, and Enterococcus**, including resistance to **latest-generation antibiotics**.

Causes of Antimicrobial Resistance

1. **Natural Evolution**: Microbes adapt through genetic mutations over time.

2. **Overuse and Misuse**: Widespread inappropriate use of antibiotics in **humans, livestock, and agriculture**.

3. **Poor Infection Control**: Low hygiene standards in hospitals and communities allow resistant strains to spread.

4. **Environmental Contamination**: Improper disposal of pharmaceuticals leads to resistant genes in water and soil.

5. **Global Travel and Trade**: AMR spreads across borders via people, food, and goods.

Impacts of Antimicrobial Resistance

- **Public Health Threat**:
    - Reverses gains made in combating infectious diseases like **TB, typhoid, pneumonia**.
    - **30,000 newborn deaths annually** in Indian ICUs due to drug-resistant infections.
- **Increased Mortality**:
    - Projected **39 million deaths globally** by 2050.
- **Healthcare Burden**:
    - **Longer hospital stays**, expensive treatments, and overloaded health infrastructure.
- **Economic Burden**:
    - Potential **$3.4 trillion GDP loss annually by 2030**.
- **Pandemic Impact**:
    - During COVID-19, misuse of steroids led to **mucormycosis (black fungus)** in India.

Challenges in Tackling AMR in India

1. **Over-the-Counter Antibiotics**:
    - Easy availability promotes **self-medication and incomplete dosage**.
2. **High Population Density**:
    - Cities like **Kolkata (30,097/km²), Mumbai (20,634/km²)** intensify the spread of resistant pathogens.
3. **Infectious Disease Prevalence**:
    - High burden leads to **excessive antibiotic usage**.
4. **Multidrug Resistance**:
    - Diseases like **MDR-TB and XDR-TB** are increasingly difficult to treat.
5. **Low Awareness**:
    - Public and practitioners often unaware of AMR risks and rational drug use.
6. **Weak Regulation**:
    - Poor enforcement of rules like **Schedule H1** of the Drugs and Cosmetics Act.
7. **Inadequate Genomic Tools**:
    - Genomic tracking is not yet available at the clinical point-of-care.

Global and National Efforts Against AMR

Global Initiatives:

- **UNGA High-Level Meetings (2016 & 2024)**:
    - Promote national action plans, R&D, and policy coordination.

- **Global AMR Surveillance System (GLASS)**:
    - Facilitates data sharing and global monitoring.

India's Response:

- **National Action Plan on AMR (2017)**:
    - Aims at awareness, surveillance, infection prevention, and optimized use.
- **Delhi Declaration (2017)**:
    - Inter-ministerial commitment to the **One Health** approach.
- **Schedule H1 Rule (2011)**:
    - Restricts over-the-counter antibiotic sales (modified later for first-line drugs).
- **Institutional Surveillance**:
    - **ICMR, NCDC, ICAR** running pathogen surveillance programs.
- **CMC Vellore**:
    - Reference center for genomic sequencing and AMR data.
- **New Antibiotics Developed in India**:
    - Examples: **cefepime-enmetazobactam, levodifloxacin** — alternatives to last-resort drugs.
- **AI-Driven Tools**:
    - **AMRSense** uses hospital data to predict AMR trends.
- **Kerala's Policy Innovation (2024)**:

- First Indian state to **ban OTC sale of antibiotics** without prescriptions.

What Lies Ahead? Recommendations and Way Forward

1. **Strengthen Hospital Surveillance**:
   - Publicize infection data to promote transparency.
2. **Monitor Environmental Pollution**:
   - Analyse effluents from hospitals and pharma industries.
3. **Leverage Genomic Labs (Post-COVID)**:
   - Use existing labs for AMR mapping and prediction.
4. **Develop Targeted Diagnostics**:
   - Tools based on genome markers (e.g., for **Salmonella Typhi**).
5. **Promote Antimicrobial Stewardship**:
   - Train **doctors, pharmacists, and informal providers** in rational antibiotic use.
6. **Enhance Communication and Awareness**:
   - Design **mass campaigns** for public engagement on AMR risks.
7. **Strengthen Regulation**:
   - Uniform implementation of Schedule H1 across all Indian states.

Conclusion

Antimicrobial Resistance is not just a medical challenge; it is a **socio-economic and governance crisis**. India, being among the countries most affected, must act urgently. While surveillance, research, and innovation have made strides, they must be matched with strong **public health communication, strict regulatory enforcement, and multisectoral coordination**. With the right blend of science, policy, and public participation, **India can lead the global fight against AMR**.