World Journal of Pharmaceutical Science and Research
www.wjpsronline.com
Research Article
ISSN: 2583-6579
SJIF Impact Factor: 5.111
Year - 2025
Volume: 4; Issue: 4
Page: 938-940

ANTIMICROBIAL RESISTANCE: CURRENT CHALLENGES AND STRATEGIES

Mayur M. Borade*, Mayur P. Patil, Darshan M. Chaudhari and Atharva Pawar

KCT's R.G. Sapkal Institute of Pharmacy, Anjaneri, Trimbakeshwar Road, Nashik (MH) - 422213.

Article Received: 26 July 2025 | | ***Article Revised: 17 August 2025*** | | ***Article Accepted: 08 September 2025***

***Corresponding Author: Mayur M. Borade**
KCT's R.G. Sapkal Institute of Pharmacy, Anjaneri, Trimbakeshwar Road, Nashik (MH) - 422213.
DOI: https://doi.org/10.5281/zenodo.17122391

How to cite this Article: Mayur M. Borade, Mayur P. Patil, Darshan M. Chaudhari and Atharva Pawar (2025). ANTIMICROBIAL RESISTANCE: CURRENT CHALLENGES AND STRATEGIES. World Journal of Pharmaceutical Science and Research, 4(4), 938-940. https://doi.org/10.5281/zenodo.17122391

Copyright © 2025 Mayur M. Borade | World Journal of Pharmaceutical Science and Research.
This work is licensed under creative Commons Attribution-NonCommercial 4.0 International license (CC BY-NC 4.0)

ABSTRACT

Antimicrobial resistance (AMR) has emerged as one of the greatest threats to global public health in the 21st century. It jeopardizes the effectiveness of life-saving medications, increases the risk of medical procedures, and escalates healthcare costs. This review discusses the major causes of AMR, its global and regional burden, and current strategies to combat it. It emphasizes the importance of antimicrobial stewardship, surveillance, novel therapies, and the role of healthcare professionals, especially pharmacists, in controlling resistance.

KEYWORDS: Antimicrobial resistance, antibiotics, stewardship, surveillance, drug resistance, healthcare policy.

1. INTRODUCTION

Antimicrobial resistance (AMR) occurs when microorganisms such as bacteria, viruses, fungi, and parasites evolve to resist the effects of medications, rendering standard treatments ineffective and infections harder to treat.[1] The World Health Organization (WHO) has declared AMR one of the top 10 global public health threats.[1] If unaddressed, AMR could lead to 10 million deaths annually by 2050.[2]

2. Causes and Challenges of AMR

2.1 Overuse and Misuse of Antibiotics

Misuse of antibiotics in humans—such as self-medication, overprescription, and failure to complete courses—drives the selection pressure for resistant organisms.[4] This is especially concerning in countries where antibiotics are sold over the counter without prescriptions.[6]

2.2 Use in Agriculture

The use of antibiotics as growth promoters in livestock and aquaculture contributes significantly to resistance.[7] Residual antibiotics can enter the food chain and the environment, spreading resistance genes.

2.3 Lack of New Drug Development

Pharmaceutical industries have deprioritized antibiotic development due to lower profitability and scientific challenges, leading to a 'discovery void'.[5]

2.4 Poor Infection Control and Sanitation

Inadequate hygiene practices in hospitals and communities foster the transmission of resistant pathogens.[6]

3. Global and Regional Situation

3.1 Global Trends

WHO's Global Antimicrobial Resistance Surveillance System (GLASS) tracks resistance patterns worldwide.[1] The CDC reports that over 2.8 million AMR infections occur annually in the U.S., causing 35,000 deaths.[8]

3.2 AMR in India

India has one of the highest rates of AMR, fueled by high antibiotic consumption, insufficient regulation, and environmental contamination.[3] The Indian Council of Medical Research (ICMR) AMR surveillance network monitors resistance patterns and trends.[3]

4. Strategic Interventions to Combat AMR

4.1 Antimicrobial Stewardship Programs (ASPs)

ASPs promote the appropriate use of antimicrobials in clinical settings through prescribing guidelines, de-escalation therapy, and monitoring⁹. They are critical even in resource-limited settings.[10]

4.2 Surveillance and Monitoring

National and international surveillance systems like GLASS and ICMR's AMR surveillance help track resistance trends and guide policy.[38]

4.3 Infection Prevention and Control (IPC)

Strict adherence to hand hygiene, sterilization, and isolation protocols in healthcare facilities reduces AMR spread.[6]

4.4 Research and Development

There is an urgent need to develop novel antimicrobials, alternative therapies (such as bacteriophages), and rapid diagnostic tools.[5]

5. Role of Pharmacists and Healthcare Professionals

Pharmacists play a vital role in antibiotic stewardship by ensuring rational drug use, counseling patients, preventing self-medication, and educating the community.[10] Multidisciplinary teams, including microbiologists and infection control specialists, are essential for successful stewardship.

6. CONCLUSION

Antimicrobial resistance is a complex, evolving threat that requires urgent, coordinated global action. Strengthening stewardship, enhancing surveillance, supporting innovation, and involving all sectors—human, animal, and environmental health—are key to containing AMR. A 'One Health' approach integrating these dimensions is essential for sustainable outcomes.[7]

REFERENCES

1. World Health Organization. Global action plan on antimicrobial resistance [Internet]. Geneva: WHO; 2015 [cited 2025 Jun 8]. Available from: https://www.who.int/publications/i/item/9789241509763
2. O'Neill J. Tackling drug-resistant infections globally: final report and recommendations. Review on Antimicrobial Resistance, 2016.
3. Indian Council of Medical Research. Annual report on antimicrobial resistance surveillance network. New Delhi: ICMR, 2023.
4. Ventola CL. The antibiotic resistance crisis: part 1: causes and threats. P T., 2015; 40(4): 277–83.
5. Spellberg B, Bartlett JG, Gilbert DN. The future of antibiotics and resistance. N Engl J Med., 2013; 368(4): 299–302.
6. Holmes AH, Moore LS, Sundsfjord A, et al. Understanding the mechanisms and drivers of antimicrobial resistance. Lancet, 2016; 387(10014): 176–87.
7. Laxminarayan R, Duse A, Wattal C, et al. Antibiotic resistance—the need for global solutions. Lancet Infect Dis., 2013; 13(12): 1057–98.
8. Centers for Disease Control and Prevention. Antibiotic resistance threats in the United States, 2019. Atlanta: CDC; 2019.
9. Klein EY, Van Boeckel TP, Martinez EM, et al. Global increase and geographic convergence in antibiotic consumption between 2000 and 2015. Proc Natl Acad Sci USA, 2018; 115(15): E3463–70.
10. Sutherland R, Masters GA. Antimicrobial stewardship programs in resource-limited settings: a practical guide. J Glob Health, 2021; 11: 03015.