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Review Article

Strategies to Address Antibiotic Resistance through Antimicrobial Stewardship

Harshith Gowda J.*, Dr. Divyashree N., Prathiksha K. M., Vedavathi N., Prakash

Department of Pharmacy Practice, Bharathi College of pharmacy, Bharathinagara.

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ABSTRACT

A serious danger to global health, antimicrobial resistance (AMR) reduces the effectiveness of antibiotics and raises morbidity, mortality, and medical expenses. By encouraging the best possible use of antibiotics, reducing resistance, and enhancing patient outcomes, antimicrobial stewardship (AMS) initiatives play a vital role in the fight against antimicrobial resistance (AMR). The fundamental tenets of AMS, including as evidence-based recommendations, diagnostic advancements, public health integration, and international cooperation, are examined in this review. It addresses issues including resource constraints and policy gaps while highlighting effective tactics like infection control, surveillance, and education. In order to maintain the effectiveness of antibiotics for future generations, the paper emphasises the necessity of a multipronged strategy to guarantee sustainable AMS deployment.


INTRODUCTION

A global public health emergency, antimicrobial resistance (AMR) poses a danger to decades of medical advancement. When bacteria, viruses, fungi, and parasites develop defence mechanisms against the effects of antimicrobial drugs, treatments become ineffective. This is known as antimicrobial resistance (AMR). According to the World Health Organisation (WHO), bacterial AMR is directly responsible for 1.27 million fatalities each year, making it one of the top 10 worldwide public health problems. According to

estimates, AMR might kill 10 million people annually by 2050 if immediate action is not taken, costing the world economy \$100 trillion in total. The main causes of AMR are the overuse and abuse of antibiotics in agriculture, animal husbandry, and human healthcare. This problem is made worse by improper prescribing practices, the use of antibiotics to promote animal development, and the availability of antibiotics over-the-counter in some areas. The issue is made worse by the stalling of new antibiotic development, which

***Corresponding Author:** Harshith Gowda J

Address: Department of Pharmacy Practice, Bharathi College of pharmacy, Bharathinagara.

Email : harshithj47@gmail.com

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leaves healthcare systems with few alternatives for treating illnesses that are resistant. One of the most important tactics in the fight against AMR is antimicrobial stewardship, or AMS. A coordinated series of actions known as AMS is intended to maximise the use of antibiotics, enhance patient outcomes, and lessen side effects, such as resistance. Effective AMS programs incorporate rapid diagnostic instruments, education, surveillance systems, and evidence-based prescribing guidelines into medical procedures. In order to lessen the burden of infectious diseases, these initiatives also encourage infection prevention strategies including immunisation and good hygiene.

2. Core Strategies in AMS

2.1 Awareness and Education

One of the main pillars of AMS is ongoing education for the public and healthcare professionals. Unsuitable antibiotic prescriptions have been shown to decrease with the use of educational interventions such as workshops, seminars, and online training.^{[1][2]}

2.2 Implementation of Policies and Guidelines

Infection control and prescription practices are standardized with the support of institution-specific guidelines. Local epidemiological data, antibiograms, and resistance patterns are frequently the basis for these recommendations.^[1]

2.3 Prescription Optimization

AMS initiatives promote behaviours like:

- Therapy de-escalation according to cultural findings.
- Optimizing antibiotic treatment duration to avoid misuse.
- Limiting some antibiotics that pose a high risk in order to reduce resistance^[3].

2.4 Technology and Diagnostic Instruments

Rapid molecular testing and other diagnostic advancements help identify bacteria early and precisely, allowing for focused therapy and

lowering the need for broad-spectrum antibiotics.^{[2][3]}

2.5 Data-Based Interventions

Artificial intelligence (AI) and machine learning are becoming more popular as methods for tracking prescribing practices in real time, optimising antibiotic use, and forecasting resistance trends.^[2]

3. AMS Program Expansion

3.1 Combined with the Prevention of Infection

The spread of resistant illnesses can be stopped by combining AMS with effective infection control strategies including immunisation campaigns and hand hygiene.^[1]

3.2 Examining Agricultural Use

Since livestock and agriculture are major contributors to resistance, it is imperative that antibiotic use be reduced in these industries. Reliance on antibiotics can be decreased by using other strategies like probiotics and animal vaccines.^[2]

3.3 Cooperation and Connection

To address AMR on a bigger scale, global cooperation through institutions like the World Health Organisation (WHO) makes it easier to share best practices and harmonised rules.^{[1][3]}

4. Future Directions and Difficulties

The absence of common guidelines, scarce resources, and disparities in implementation levels among nations are major obstacles. To overcome these obstacles, AMS infrastructure must be strengthened, research must be funded, and technology must be used.^{[1][2]}

5. Conclusion

One urgent global health issue that need prompt and concerted action is antimicrobial resistance (AMR). By encouraging the prudent use of antibiotics and putting evidence-based practices into practice to improve patient care, antimicrobial stewardship (AMS) is a key component in the fight against antimicrobial resistance (AMR). AMS programs can dramatically lower resistance rates



and improve treatment results by implementing interventions such educational campaigns, fast diagnostic tools, surveillance systems, and infection prevention measures. But for AMS to be successful, obstacles such a lack of funding, ignorance, and inconsistent policies must be overcome, especially in low- and middle-income nations. To overcome these obstacles, a multipronged strategy including governments, medical professionals, researchers, and international organisations is necessary. Furthermore, maintaining the effectiveness of antibiotics for upcoming generations depends on funding for the research of novel antimicrobials, public awareness initiatives, and international cooperation. It is feasible to lessen the increasing threat of AMR and protect world health by bolstering AMS initiatives and incorporating them into larger public health frameworks. Delaying these initiatives could have lasting effects on patient safety and global healthcare systems, thus the time to act is now.

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