



## The role of family medicine in combating antimicrobial resistance: A discourse

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### Abstract

Antimicrobial resistance (AMR) is a critical global health threat, undermining decades of progress in the treatment and prevention of infectious diseases. The increasing prevalence of resistant pathogens worldwide has resulted in higher morbidity, mortality, prolonged hospitalizations, and rising healthcare costs. This challenge is particularly pronounced in low- and middle-income countries such as Bangladesh, where resistance to commonly used antibiotics has been widely reported and access to diagnostic facilities and antimicrobial stewardship programs remains limited. Key drivers of AMR include the overuse and misuse of antibiotics, inappropriate prescribing practices, poor adherence to treatment regimens, and the widespread use of antimicrobial agents in agriculture and animal husbandry. Microorganisms acquire resistance through genetic mutations, horizontal gene transfer, and other adaptive mechanisms, rendering previously treatable infections increasingly difficult to manage. Family medicine, with its emphasis on continuous, comprehensive, and patient-centred care, provides an effective framework to address this challenge, especially in resource-constrained settings like Bangladesh. Family physicians can promote rational antibiotic use, ensure adherence to prescribed treatments, educate patients on hygiene and infection prevention, and monitor resistance patterns at both individual and community levels. This article reviews the mechanisms of AMR, evaluates global strategies, and highlights the pivotal role of family physicians in prevention, antimicrobial stewardship, health promotion, and community engagement, emphasizing their importance in mitigating AMR and preserving antibiotic efficacy in Bangladesh and beyond.

**Keywords:** Global health, antimicrobial resistance, family medicine, antibiotic stewardship, primary care

### Introduction

Global health is facing increasingly complex challenges, even as technological advances continue to improve health promotion and disease control. Coordinated efforts by international organizations to prevent, control, and treat both communicable and non-communicable diseases have significantly contributed to longer life expectancy and improved quality of life. Among the notable achievements of modern medicine is the effective management and prevention of infectious diseases, largely made possible through the development and use of antimicrobial agents and vaccines. Despite these advances, a significant and emerging threat to public health is antimicrobial resistance (AMR) [1]. Antimicrobial resistance is increasing rapidly in Bangladesh, significantly compromising efforts to prevent and manage infectious diseases. Evidence from low- and middle-income countries demonstrates that weak antimicrobial stewardship, inappropriate prescribing, and limited regulatory oversight are major drivers of this trend, placing Bangladesh at heightened risk [2]. Inadequate antimicrobial stewardship practices among healthcare professionals represent a significant contributing factor, as evidenced by a national cross-sectional survey that identified substantial gaps in knowledge and practice related to rational antibiotic use. [3] Many patients present to healthcare providers with antibiotic susceptibility reports indicating resistance to first-line treatments. Studies have shown that *Pseudomonas aeruginosa* infections in Bangladesh exhibit resistance rates exceeding 50% to commonly prescribed antibiotics, including ciprofloxacin, third-generation cephalosporins, azithromycin, and gentamicin [4]. Alarming, azithromycin has been reported to be completely ineffective in treating wound and urinary

tract infections, while ceftriaxone and cefixime show 100% ineffectiveness in tracheal infections [5]. These findings underscore that AMR represents a critical public health challenge in Bangladesh, with serious implications for treatment outcomes and disease management.

### Definition Antimicrobial Resistance (AMR)

To define antimicrobial resistance, it is necessary to look at the definition of antimicrobials at first. Antimicrobials can be defined as:

Chemical substances which are often derivatives of natural products produced by the living organisms and possess distinct physical, chemical and biological properties which make them ideal chemotherapeutic agents for treating infections [6]. They are capable of inhibiting and/or killing a wide range of microbes including bacteria (antibiotics), viruses (antiviral), fungi (antifungals) and parasites (antiparasitics including antimalarials). Antibiotics are subdivided into bacteriostatic inhibiting bacterial growth in the host and bactericidal, directly killing bacteria [7].

Antimicrobial resistance (AMR) occurs when microorganisms are able to survive and reproduce despite exposure to antimicrobial agents [8]. AMR can be classified into two main types: intrinsic and acquired. Intrinsic resistance is a natural characteristic of a microbial species. For example, some microorganisms lack the specific target site for a particular antibiotic, rendering the drug ineffective. Other mechanisms contributing to innate resistance include the presence of thick cell walls and active efflux systems that expel antibiotics from the cell. Acquired resistance, on the other hand, develops through genetic changes such as mutations or the acquisition of resistance genes. Bacteria can alter cell permeability by modifying lipopolysaccharide

structures, reducing porin channels, or overexpressing efflux pumps, all of which reduce the efficacy of antimicrobial agents [9]. Random mutations in the genetic code can also enable microorganisms to withstand the effects of antibiotics. Furthermore, microorganisms can exchange genetic material carrying resistance determinants, allowing the spread of AMR within and across species.

### Literature Review

Levy (1998), in his seminal article *“The Challenge of Antibiotic Resistance,”* underscores that antibiotic resistance constitutes the largest proportion of antimicrobial resistance, warranting heightened attention in contemporary medicine [10]. He identifies genetic mutations and the overuse of antibiotics as primary drivers of resistance. Moreover, resistance genes are frequently exchanged among bacteria through mechanisms such as plasmid transfer or viral mediation. Levy also highlights the inadvertent role of antibiotics in promoting resistance by impacting non-target “bystander” bacteria, which may serve as reservoirs of resistance traits. The indiscriminate use of disinfectants and antiseptics, alongside the application of antibiotics in agriculture and horticulture, is further implicated in the emergence of resistant strains [11].

To counteract these trends, Levy proposes targeted strategies for both healthcare providers and consumers, emphasizing the preservation of susceptible bacterial populations to combat resistant strains. Central to these strategies is adherence to prescribed antibiotic courses. Family physicians, by providing longitudinal care, are uniquely positioned to ensure compliance, prevent the accumulation and inappropriate reuse of leftover medications, and monitor resistance patterns across family units, thereby extending surveillance to the broader community [12].

The World Health Organization’s *Global Action Plan on Antimicrobial Resistance* (2015) outlines five strategic objectives to address AMR: improving awareness and knowledge through education and communication; strengthening surveillance and research; implementing preventive measures such as hygiene and sanitation; ensuring optimized antimicrobial use in human and animal health; and developing sustainable economic strategies to support innovation [13]. A key component of the plan is the “One Health” approach, which recognizes the interconnectedness of human, animal, and environmental health. Family physicians, embedded within local communities, are well-positioned to implement this approach by promoting preventive health measures, encouraging responsible antimicrobial use, and facilitating data integration to inform public health interventions [14].

Hansen *et al.* (2015) emphasize the critical role of primary care in mitigating AMR, noting that general practitioners (GPs) prescribe the majority of antibiotics for common community infections, such as acute respiratory infections (ARIs) [15]. The study highlights that effective communication between GPs and patients reduces unnecessary antibiotic demand and prescribing. Family physicians, through a person-centered and holistic approach, can detect early signs of antibiotic resistance and implement preventive strategies at the individual and community levels. By fostering appropriate prescribing habits and engaging in patient education, primary care practitioners can significantly limit the spread of resistant infections,

demonstrating the pivotal role of family medicine in addressing the AMR crisis [16].

### Discussion

To understand the contribution of family medicine in addressing antimicrobial resistance (AMR), it is first necessary to define the discipline. According to Rakel and Rakel (2016):

Family medicine is the medical specialty that provides continuing and comprehensive health care for the individual and the family. It is the specialty in breadth that integrates the biologic, clinical and behavioural sciences. The scope of family medicine encompasses all ages, genders, each organ system and every disease entity (p.5) [17].

Family medicine is a medical specialty that provides continuous and comprehensive healthcare for individuals and families. It integrates biological, clinical, and behavioral sciences and encompasses all ages, genders, organ systems, and disease entities. This breadth allows family physicians to monitor and identify emerging patterns of AMR within individuals and across communities, positioning them to respond effectively to this public health challenge. A central principle of family medicine is its commitment to the person rather than a specific disease, technique, or body of knowledge [18]. This approach enables early recognition of antibiotic resistance at any stage of life and facilitates tailored treatment decisions, including the selection of appropriate antimicrobial agents for each patient. Preventive care and health promotion, key components of family medicine, directly address the root causes of AMR by reducing the incidence of infections that require antibiotic therapy. In primary care, family physicians frequently interact with patients, on average four times per year, providing opportunities to reinforce preventive practices and encourage adherence to treatment regimens [19].

As first-contact providers, family physicians play a critical role in rational antibiotic prescribing, determining when treatment is necessary and for what duration. Given that the majority of antibiotics are prescribed in primary care, their decisions have a substantial impact on the emergence of resistance (Hansen *et al.*, 2015) [20]. Effective management of diagnostic uncertainty, patient safety, and communication further enhances appropriate prescribing. Family physicians also contribute to community-level surveillance and research by collecting data on resistance trends, supporting evidence-based interventions. Longitudinal care enables family physicians to build trust and influence patient behaviour, promoting hygiene, vaccination, and other preventive measures. By addressing both individual patients and population-level risks, family medicine integrates preventive medicine, behavioural science, and community engagement, making it an essential strategy in combating AMR [21].

### Conclusion

Antimicrobial resistance (AMR) has become a critical global health threat, endangering populations worldwide and demanding coordinated action across multiple sectors and disciplines. Family medicine occupies a central role in this effort, as family physicians serve as the first point of contact within healthcare systems, providing continuous, comprehensive, and community-centred care. Through longitudinal patient management, they can implement preventive strategies, ensure rational antibiotic use, monitor resistance patterns, and contribute to community-level

research, thereby reducing the overall need for antimicrobial agents. Despite these strengths, the influence of family medicine remains limited in sectors such as food production and animal health, where indiscriminate antibiotic use contributes to resistance in human populations. Expanding the role of family physicians to include participation in public awareness campaigns and targeted counselling for individuals working in these high-risk sectors can further mitigate the spread of AMR. By integrating individualized patient care with community engagement and cross-sector collaboration, family medicine can play a pivotal role in controlling AMR and preserving the effectiveness of antimicrobial agents for future generations.

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