

Antimicrobial Resistance (AMR): A Global Health Threat

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Journey of modern antimicrobials started after invention of penicillin by Alexander Fleming in early part of 20th century.¹ History of antimicrobials is not exceeding 100 years. But now antimicrobial resistance (AMR) is a global health problem. Unresponsiveness of a microorganism to antimicrobials is called AMR.² Resistance to antimicrobial agents can be innate (natural) or acquired. Naturally, anaerobic bacteria are resistant to aminoglycosides due to lack of oxygen dependent transport mechanism that is required for entering bacterial cells. Cell wall synthesis inhibitors never act against chlamydial infection as they lack cell wall and Isoniazid (INH) is not effective against other organisms as it acts only by inhibiting mycolic acid synthesis.³ Primary mechanisms of microbial resistance are (1) inactivation of the drug by microbial enzymes, e.g. Inactivation of penicillins and other β -lactam antibiotics by β -lactamase enzymes, (2) decreased accumulation of the drug within the microbe, e.g. Decreased uptake and increased efflux of fluoroquinolones and tetracyclines and (3) reduced affinity of the target site (macromolecule) for the drug e.g. reduced affinity of ribosomes for aminoglycosides, chloramphenicol, clindamycin, macrolides, or tetracyclines.⁴ Acquired drug resistance arises from spontaneous mutation or from the transfer of plasmids. These spontaneous mutations occur at a relatively constant rate, such as in 1 in 10¹² organisms per unit of time.³ If the organisms are exposed to an antimicrobial drug during this time period, the sensitive organisms may be

eradicated, but the resistant mutant multiply and become the dominant strain. The probability of mutation increases due to exposure of an organism to sub therapeutic concentrations and prolonged exposure to an antibiotic.^{3,4} Misuse of antibiotics in agriculture, food production and especially among humans and animals is the predominant factor in the emergence and spread of AMR.⁵ This AMR spreads via human traveling and poor sanitation practices, which lead to deaths from infections worldwide.^{6,7} In developing countries, lack of laboratory diagnostic facilities led to the introduction of empiric, pragmatic, and problem oriented management strategies for the administration of antimicrobial drugs, which results in over treatment.⁶

Prevention (limitation) of AMR may be done by avoidance of indiscriminate use of antibiotic, restricting use of antimicrobial combinations to appropriate circumstances e.g. TB, constant monitoring of resistance patterns in hospital or community and restriction of use of the newest antimicrobials etc. Specially, in developing countries greater regulation of antibiotics use is essential. This must be accompanied by strategies to improve the consciousness of doctors, veterinarians as well as public about the appropriate use of antimicrobials.^{7,8} The post antibiotic era is a new era in which existing antibiotics become resistance and simple infections as well as minor injuries will destroy both the human and animal.^{7,9}

AMR is spreading throughout the world and threatens to destroy the great advances made in human medicine. To address this crisis, global collaboration is essential. It is not simply a human health issue, but also an environmental one. It is up to the human race to take up this challenge and save the world from this threat.

Dr. Md. Shamim Ahmed

Associate Professor

Department of Pharmacology and Therapeutics

North Bengal Medical College, Sirajganj,

Bangladesh

✉Shamim.ma12@gmail.com

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