

# Developing Countries Need Action Plans to Combat the Challenge of Antimicrobial Resistance

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## Editorial

Successful use of antimicrobials agents has been compromised by the resistance developed by all classes of microorganisms namely bacteria, viruses, fungi and protozoans. Microbes develop resistance employing a number of complex genetic, biochemical and physiological processes. Lack of basic knowledge of these processes is the reason we achieved very little in control and prevention of infectious diseases [1]. Drug resistant strains of viruses including HIV-1, influenza, and hepatitis viruses, multi drug resistant bacteria or super bugs such as Methicillin Resistant Staphylococcus Aureus (MRSA) as well as multi-drug resistant strains of Mycobacterium tuberculosis and drug resistant malarial plasmodium strains are some of the examples having global impact and concern [1,2].

On one hand scientists have always been attempting to develop new tools to cure infectious disease, on the other hand microbes are evolving to face the environmental stresses including antimicrobial agents. Magnitude of drug resistant may depend upon the level of drug administered, viability of resistant strains as well as specific mechanism adopted by the particular microbial type against the drug being used [2].

Antibiotic resistance has been one of the greatest challenges to health care professionals as well as those involved in drug discovery and development. The threat of antibiotic resistance is growing at an alarming pace, especially in the developing countries. Antibiotics, since their introduction in 1940s, on one hand have saved Millions of lives and enabled us to make the deadliest diseases curable, on the other hand bacterial resistance to most effective drugs poses a serious problem [3]. Reports from almost all countries of the world show highest level of drug resistance, even for the drugs that once considered drugs of last resort. Worst is the situation in the developing countries like India, Bangladesh, Pakistan, Nigeria, Brazil and other countries of African and Asian continents. Massive, uncontrolled and injudicious use of antibiotics has posed immense selection pressure on bacterial strains that resulted in emergence and dissemination of highly resistant bacterial strains. Several studies in these developing countries report up to over 90% antibiotic resistance that lets

us to conclude that humans are about to enter a post antibiotics era [4,5].

Similarly, drug resistance in viruses has become an increasing public health concern, where prolonged drug exposure and ongoing viral replication may result in emergence of resistant strains in immunocompromised patients. Resistance to neuraminidase inhibitors and adamantanes by influenza viruses has made the influenza treatment challenging. Another example of the insensitive viral strains is the nucleoside analogues resistant herpes viruses [5]. Similar challenges are being experienced with the treatment of HIV and Hepatitis C infections. Both clinical and laboratory studies suggest that mutants of HIV-1 vary in their resistance to antiretroviral drugs [6,7]. Both enzymatic and virologic data reveal that naturally occurring polymorphisms among different HIV subtypes can influence HIV-1 susceptibility to individual antiretroviral drugs and the propensity of HIV to acquire certain resistance mutations. WHO and its partners have already developed Global strategy for the surveillance and monitoring of HIV drug resistance to collect the data and combat the issue [8].

Global efforts towards reduction of health burden of infectious disease have been seen to be shaken by such reports and the combatting drug resistance requires dedicated endeavors from all countries across the globe. In May 2015, sixty eights World Health Assembly adopted global action plan on antibiotic resistance. The overall goal of this draft action plan is to ensure, for as long as possible, continuity of the ability to treat and prevent infectious diseases with effective and safe medicines that are quality-assured, used in a responsible way, and accessible to all who need them [9]. Member states are urged to have their own action plans that are aligned to recommendations made by the WHO. European Union, United States and a number of developed countries like Germany, Austria, Canada, Netherlands, Greece, have realized seriousness of the problem and developed their own action plans and frameworks to combat the issue of antimicrobial resistance for their own regions. For example, European action plan on antibiotic resistance (European Union), action plan on the rising threats from antimicrobial resistance and executive order-combatting antibiotic resistant bacteria (The White

House, 2014), National strategy for combatting antibiotic resistant bacteria (The White House, 2014), UK five year antimicrobial resistance strategy 2013-2018 (Department of Health UK, 2018), Nationaler Aktionsplan zur Antibiotikaresistenz (Austria), national action plan for prevention of antibiotic resistance [9,10].

No strong efforts or voice has been seen witnessed from majority of the developing countries of the world including Pakistan, despite the fact that these countries are badly affected part of the globe by infectious diseases in 21st century with highest morbidity and mortality rates. Largest market of antimicrobial drugs is the countries of the developing world and reports of highest rate of antibiotic resistance are being received from the same regions. In spite, no serious action has been taken from these countries. Rational and restricted use of antibiotics has never been implemented in these countries [11].

In many developing countries of the world, gaps exist among health care professionals on the current status of antibiotic resistance in their area due to lack of a systematic surveillance at country, provincial and district level. District head quarter hospitals often lack such facilities and information (Personal observations and communications). Treatment of infectious diseases based on results of the sensitivity testing may be a useful strategy, provided that these facilities are available at the local hospitals. Nevertheless, economic constraints may make it difficult for poor patients resulting in self-medication or private clinics. Alternative would be surveillance of antibiotic resistance at the regional level by state authorities and dissemination of current antibiotic resistance trends of different pathogens to local health care professionals [12].

A single factor or community cannot not be made accountable for the entire tragedy. Bacteria do evolve and as a result of immense selection pressure by massive use of antibiotics select resistant strains as a matter of microbial survival strategy. Scientific advancements have on one hand enabled us to take a decisive step to defeat our oldest enemies, i.e. infectious diseases; on the other hand pathogens have found their own ways out to survive. Ironically, humans too are accountable for losing the historic and decisive battle. Antibiotic abuse is one of the main reasons behind immense antimicrobial resistance and thereby our shrinking arsenals against oldest enemies of the human race. Level of antimicrobial drug resistance could have been reduced by highly controlled and judicious use of this valuable class of drugs. Local governments, health authorities, physicians, pharmacists as well as their corrupt relations are all responsible. Keeping in view the current scenario in the developing countries, one may only suggest that both developing as well as developed countries need to tackle with this problem on priority basis [12].

Pakistan, India, Bangladesh, China, Nigeria and Egypt are the developing countries with massive consumption of antibiotics (both nationwide as well as per person consumption). Antibiotic abuse, over prescription, self-medication and unrestricted sale are commonly being reported. These countries, along-with all others, need immense and dedicated efforts by adopting national action plans to control drug resistance as per recommendations of the WHO for its member states. Some of the vital strategies to handle the situation may be; ban on over the counter sell of antibiotics, antibiotic stewardship programs, auditing prescription by physicians and sale by local pharmacies, training of the physicians, pharmacists and all relevant health care professions, provision of antimicrobial sensitivity testing and surveillance of resistance trends. Last, but not the least should be strict regulations and their implementation made by the local government as well as media advocacy [13].

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