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Antibiotic resistance: Global threat to public health

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Abstract
Antimicrobial resistance (AMR) is a universal public health problem affecting the benefit of antibiotics. Antibiotic use, inappropriate dosage, and genetics led to the spread of multidrug resistance among pathogenic bacteria, and it became hard to treat infections. Antibiotic resistance crisis is widespread and still increasing, due to continuous abuse of antibiotics and deficiency of the new antibiotic industry. A multifaceted plane is required to control the antibiotic resistance crisis. Educational programs and awareness campaigns are required. Research, explanations, and solutions should be implanted. Screening and diagnostic tools of antibiotic resistance should be improved and globally applied [1].

Keywords: antibiotics, multidrug resistance, antimicrobial resistance

Introduction

What is antibiotic resistance?

Antibiotics are medicines used to prevent and treat bacterial infections. Antibiotic resistance is the ability of a microorganism to withstand the effects of an antibiotic. It is a specific type of drug resistance. Antibiotic resistance occurs when bacteria change in response to the use of these medicines. Bacteria, not humans or animals, become antibiotic-resistant. These bacteria may infect humans and animals, and the infections they cause are harder to treat than those caused by non-resistant bacteria costs.

Antibiotic resistance is a worldwide problem. The use of antibiotics is the single most important factor leading to antibiotic resistance around the world. Antibiotics are among the most commonly prescribed drugs used in human medicine.However, up to 50% of all the antibiotics prescribed for people are not needed or are not optimally effective as prescribed. Antibiotics are also commonly used in food animals to prevent, control, and treat disease, and to promote the growth of food-producing animals. The use of antibiotics for promoting growth is not necessary, and the practice should be phased out. Recent guidance from the U.S.Food and Drug Administration (FDA) describes a pathway toward this goal New forms of antibiotic resistance can cross international boundaries and spread between continents with ease. Many forms of resistance spread with remarkable speed. World health leaders have described antibiotic-resistant microorganisms as “nightmare bacteria” that “pose a catastrophic threat” to people in every country in the world. At least 23,000 people die each year as a direct result of these antibiotic-resistant infections. Many more die from other conditions that were complicated by an antibiotic-resistant infection. The world urgently needs to change the way it prescribes and uses antibiotics. Even if new medicines are developed, without behavior change, antibiotic resistance will remain a major threat [2].

Causes of Antibiotic Resistance

The causes of this global threat include excessive use of antibiotics in animals (food, pets, aquatic) and humans, antibiotics sold over-the-counter, increased international travel, poor sanitation/hygiene, poverty and release of non-Metabolized antibiotics or their residues into the environment through manure/feces. These factors contribute to antibiotic resistance [3].

Natural (Biological) Causes

a. **Selective pressure:** In the presence of an antimicrobial, microbes are either killed or, if they carry resistance genes, survive. These survivors will replicate, and their progeny will quickly become the dominant type throughout the microbial population.
b. **Mutation:** Most microbes reproduce by dividing every few hours, allowing them to evolve rapidly and adapt quickly to new environmental conditions. During replication, mutations arise and some of these mutations may help an individual microbe survive exposure to an antimicrobial.
c. **Gene transfer:** Microbes also may get genes from each other, including genes that make the microbe drug resistant. Bacteria multiply by the billions. Bacteria that have drug-resistant DNA may transfer a copy of these genes to other bacteria. Non –resistant bacteria receive the DNA and become resistant to drugs [4].

Inadequate Diagnostics

More often, healthcare providers must use incomplete and imperfect information to diagnose an infection and thus prescribe an antimicrobial just-in-case or prescribed a broad –spectrum antimicrobial when specific antibiotics might be better. These situations contribute to selective pressure and accelerate antimicrobial resistance [5].

Consequences of Antibiotics resistance

The danger of antibiotic resistance is that treatable illnesses, such as pneumonia, tuberculosis, or minor infections could become incurable. This would put a greater economic and emotional burden on families and on our healthcare system. Antibiotic resistance results in a decreased ability to treat infections and illnesses in people, animal and plants [6]. In addition, almost 250,000 people each year require hospital care for *Clostridium difficile (C. difficile)* infections. In most

of these infections, the use of antibiotics was a major contributing factor leading to the illness. At least 14,000 people die each year in the United States from *C. difficile* infections. Many of these infections could have been prevented.

Antibiotic-resistant infections add considerable and avoidable costs to the already overburdened U.S. health care system. In most cases, antibiotic-resistant infections require prolonged and/or costlier treatments, extend hospital stays, necessitate additional doctor visits and healthcare use, and result in greater disability and death compared with infections that are easily treatable with antibiotics. The total economic cost of antibiotic resistance to the U.S.economy has been difficult to calculate. Estimates vary but have ranged as high as $20 billion in excess direct healthcare costs, with additional costs to society for lost productivity as high as $35 billion a year (2008 dollars). This can be lead to the following problems-

- Increased human illness suffering and death,
- Increased cost and length of treatments,
- And increased side effects from the use of multiple and more powerful medications.

Who is most at risk: - In general, certain groups of people have an increased risk for getting Infections. At risk group include-Infants, especially premature babies, as they may not have strong immune systems, Seniors particularly those living in long term care facilities or seniors' residences this is because they may have a weakened immune system due to illness or extended antibiotic use. People who are homeless or living in crowded or unhygienic conditions where it is easy to contract infections. People with weakened immune system due to illness or injury.

People who have occupations that put them at a greater risk for exposure to bacteria or infectious diseases such as physicians, Nurses, veterinarians, slaughter house and meat processing plants workers and farmers [7].

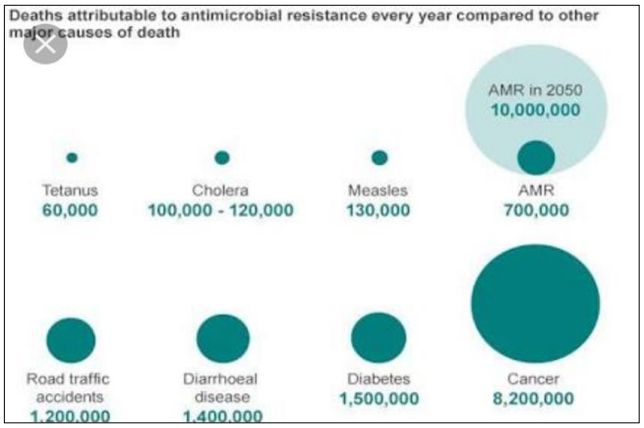

Fig 1

Preventive measures to control antibiotic resistance

The global action plan on antimicrobial resistance ha five strategic objectives.

- To improve awareness and understanding of anti-microbial resistance
- To strengthen surveillance and research
- To reduce the incidence of infection
- To optimize the use of antimicrobial medicines.
- To ensure sustainable investments in countering antimicrobial resistance [8].

At the national level evidence based guidelines on infection control can form the basis for facilitate the development and implementation of infection control programs at health care Facilities. At the community level, preventing spread of infectious diseases, resistant bacteria and promoting a healthy life style will help reduce unnecessary use of antibiotics. In this work, hygiene and sanitation initiatives, such as hand washing campaigns are important tools, as well as strengthened vaccination programs to reduce the burden of infectious diseases [9]. Individuals can only use antibiotics when prescribed by a certified health professional and by never sharing or using leftover antibiotics. Along with this can prepare food hygienically. To prevent antibiotic resistance health care professionals can- Ensure a robust national action plan to tackle antibiotic resistance is in place. Strengthen policies, programs and implementation of infection prevention and control measures. Regulate and promote the appropriate use and disposal of quality medicines. Make information available on the impact of antibiotic resistance. The healthcare professionals can invest in research and development of new antibiotics, vaccines, diagnostic and other tools.

Conclusion

Antibiotic resistance crisis is widespread and still increasing, due to continuous abuse of antibiotics and deficiency of the new antibiotic industry. Antibiotic resistance is not a problem of the future, it already has major consequences for the lives and livelihoods of people around the globe. However, looking into the close future there are man actions that can be taken by different actors at different levels to mitigate the effects of antibiotic resistance. Overall, AMR is not uncontrollable anymore. Antibiotics alternatives as probiotics and lytic bacteriophages can participate in decreasing AMR worldwide.

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