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Antimicrobial Resistance: A Catastrophic Biological Risk

K.Madhivadhani*, N.Deepa

Saveetha College of Pharmacy, Saveetha Institute of Medical and Technical Sciences, Thandalam, Chennai, Tamilnadu, India.

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ABSTRACT: In recent years antimicrobial resistance turn up into medical catastrophe. According to WHO, we are entering in the post antibiotic era in which the common infections will once again adhered. Antimicrobial resistance (AMR) is the resistance produced by microorganism against antibiotics and other drugs, which results in the drug inefficiency. This leads to increasing risks of severe disease and transmission. Current use of antibiotics not only limited with treatment of infection and also involved in medical procedures like surgeries, organ transplants, treatment of burns, and management of ailments that is cancer. There are indications of increase in antimicrobial resistance during outbreak of secondary symptoms of novel corona virus. The main purpose of this study is to develop a discussion and understanding of antimicrobial resistance and their influences over various infectious diseases including pandemic COVID 19.

Corresponding author*
Ms. K.Madhivadhani
Lecturer
Saveetha College of Pharmacy
Saveetha Institute of Medical and Technical Sciences
Thandalam, Chennai – 600077,
Chennai, Tamilnadu, India.
Mail ID: madhivadhani1@gmail.com

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INTRODUCTION:

The rapid emergence of antimicrobial resistance is occurring worldwide through endangering the efficacy of antibiotics. Antimicrobial resistance (AMR) occurs when microorganism shows significant mutations to antimicrobial drugs, thus inactivating their infective therapy. AMR are particularly referred as superbugs in which the strains of bacteria are resistant to a wide variety of antibiotics [1]. AMR has emerged as a major threat to public health estimated to cause 10 million deaths annually by 2050. India carries one of the largest burdens of drug-resistant pathogens worldwide. AMR

cases shown in India in 2008 by Metallo b lactamase enzyme [2].

The mechanism of action of antimicrobial resistant bacteria may be due to either of any one following reasons that are drug inactivation or modification, alteration of target, binding site alteration of metabolic pathway, reduced drug accumulation and ribosome splitting and recycling. Recent evidence suggests that the antibiotic resistance genes which are linked to various outcomes may also be found in viable dust bacteria and serves as a greater reservoir (Fig 1) [3].

There is currently a lack of significant and effective therapies, lack of successful prevention measures, and only a few new antibiotics which require development of novel treatment options and alternative approaches in antimicrobial therapies. Currently, amid the COVID-19 crisis, superbugs pose an exponentially greater threat during the treatment of secondary symptoms. A different Lancet study of 99 COVID-19 patients with secondary infections identified five types of bacteria in their systems, one of which - A baumannii - was antibiotic-resistant. This particular superbug can cause septic shock, resulting in severe organ damage and, in some cases, death (Fig 2) [2,3].

In this review we can discuss the resistance caused by various bacteria and its influences and also the steps and policy taken around globally to overcome the serious biological crisis.

REASONS FOR AMR:

AMR arises from the misuse and overuse of antibiotics in humans and animals. Poor infection control and inappropriate food handling encourage the spread of antimicrobial resistance. Genetic mutation in microorganism paved the way for global threat (Table 1). The misuse and overuse of antibiotics in humans and animals may be due to either self-medication of drugs or non-consulting of a Physician or wrong medication by Physician. Mostly AMR takes place due to use of broad spectrum antibiotics [4].

MECHANISM OF RESISTANCE:

Bacteria can thus become resistant by developing mechanisms to prevent antibiotics binding to their molecular target either by inactivating or degrading antibiotics, modifying the target site, decreasing cell wall permeability (reducing antibiotic entry into bacterial cells) or active efflux, and metabolic bypass.

Viruses show a range of mechanisms by which an organism can acquire resistance, the simplest being genetic mutation.

In the targeted viral genes, genetic mutation takes place due to various significant mechanism that are the drug classes: nucleotide reverse transcriptase inhibitors (NRTIs) non-nucleoside reverse transcriptase inhibitors (NNRTIs), protease inhibitors (PIs) and integrase inhibitors (INIs), have now appeared through a number of genetic mutations. This mutation causes drug resistance. Resistant variants are detectable in the majority of patients with treatment failure to NS3 protease inhibitor –or NS5a inhibitor-based antiviral therapy. The most common being induction of the efflux pumps encoded by the MDR or CDR genes, and acquisition of point mutations in the gene encoding for the target enzyme (ERG11). Acquired resistance of Candida species to enhinocandins is typically mediated via acquisition of point mutations in the FKS genes encoding the major subunit of its target enzyme [4,5].

AMR-WHO GOVERNMENT INITIATIVES:

In May 2015, WHO initiated the global action plan on antimicrobial resistance through strategic objectives and also strengthened the technical assistance to help other countries to exaggerate the national action plans. The newer policies have also been in GLASS/GARDP/IACG to improve coordination between international organizations and to ensure effectiveness against global threat [6].

AMR IN INDIA:

India carries one of the largest burdens of drug-resistant pathogens worldwide, including the highest burden of multidrug-resistant tuberculosis, alarmingly high resistance among Gram-negative and Gram-positive bacteria even to newer antimicrobials such as carbapenems and faropenem since its introduction in 2010. Regional studies report high AMR among pathogens such as *Salmonella typhi*, *Shigella*, *Pseudomonas,* and *Acinetobacter* [7].

Annually, more than 50,000 newborns are estimated to die from sepsis due to pathogens resistant to first-line antibiotics. While exact population burden estimates are not available, neonates and elderly are thought to be worse affected. Two million deaths are projected to occur in India due to AMR by the year 2050. India's National Action Plan (NAP) for AMR was released in April 2017 by the Union Ministry of Health and Family

Welfare [7]. The objectives of the NAP include improving awareness, enhancing surveillance measures, strengthening infection prevention and control, research and development, promoting investments, and collaborative activities to control AMR [8,9].

AMR IN COVID 19:

COVID 19 is a novel coronavirus causing pandemic all over the world. Drug Researchers focused on the new drug development for antiviral features. Among 50 % of patients suffered with corona shows secondary symptoms such as bacterial infections, fever etc. So research on drug development for coronavirus must also focuses the need and emergency of action against drug resistant microorganisms [11,12].

In order to prevent the misuse of antibiotics Indian government (CDSCO) scheduled the antibiotics To H1 schedule of drugs from March 2014. The H1 list includes 24 antibiotics, such as third-generation and fourth-generation cephalosporins, carbapenems, antituberculosis drugs, and newer fluoroquinolones. The lack of newer antibiotics is a worldwide problem and is certainly a challenge for India. Novel approaches like peptide based therapy and non-antibiotic infective therapy, peptide vaccines can create a major impact against AMR [14].

CONCLUSION:

Since Antimicrobial resistance existed from the 1960s, in recent years it has become a global outbreak by resisting various newer antibiotics and putting an end to infectious treatment. During novel approaches for any treatment strategy we must consider the chances of AMR and their preventive measures. This drastic issue can break out by reducing the frequent antimicrobial usage and sharing the responsibilities among multiple stakeholders from public health to health care professionals.

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