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Anti-microbial resistance: An alarming issue

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Abstract
The emergence of antimicrobial resistance in microbes as a result of the indiscriminate and careless use of antibiotics has presented a hitherto unheard-of risk to human civilization. It is challenging to due to bacteria's capacity to acquire resistance against antimicrobial substances, cure bacterial infections. Significant factors in the development of antibiotic resistance include spontaneous evolution, bacterial mutation, and horizontal gene transfer. The clinically available medication is currently ineffective against the antibiotic resistance some bacterial species have evolved. Not only do urgent actions need to be taken to reduce the prophylactic and therapeutic usage of antibiotics, but they also need to be taken to explore for alternate methods of bacterial infection control. Due to an increase in hospital admissions and medicine usage, AMR raises healthcare expenses. It is necessary to take action to reduce the preventive and therapeutic usage of antibiotics. This paper analyses the global antimicrobial resistance situation, causes that encourage its spread, control methods, and constraints.

Keywords: Anti-microbial resistance, alarming issue, antibiotics

Introduction
When bacteria, viruses, fungi, and parasites are able to adapt and proliferate in the presence of drugs that once negatively affected them, this is known as antimicrobial resistance (AMR) (Founou RC, 2017) [11]. The major public health issue is antimicrobial resistance (AMR), particularly in developing nations where relatively easy access and higher medication consumption have resulted in disproportionately higher incidences of inappropriate antibiotic use and higher levels of resistance compared to developed nations (WHO, 1996).
Since the development of antibacterial medications, once lethal bacterial illnesses can now be treated, making them a vital component of contemporary healthcare. Irrational and uncontrolled use of antibiotics in humans and animals is the main cause of antimicrobial resistance. All forms of pathogens, including bacteria, mycobacteria, viruses, fungi, and parasites, suffer from the issue of antimicrobial resistance (AMR). By 2050, AMR will have claimed 10 million lives and cost the world $100 trillion annually if proper steps are not taken to stop it (O'Neill J, 2016) [26]. AMR is a problem that affects every nation, regardless of its money or degree of development, in contrast to some other health challenges since resistant microorganisms know no national boundaries (WHO 2014) [26].
Less expensive and off-label uses of antibiotics increases the demand in many sectors. Irresponsible and enormous use of the antibiotics, has contributed significantly to the advent of the resistant strains (Chopra R, 2002) [5]. In the earlier days, the production of new antibiotics was directly proportional to the development of resistant strains. combat emerging and re-emerging resistance of pathogens globally, the mainstream approach in fighting against the diseases is now focused on the modification of existing antibiotics (Davies J, 2010) [6].
Development of technology Nowadays, more individuals are aware of the negative effects brought on by drug resistance, but very few take proactive measures to stop the resistance by avoiding overusing antibiotics (Grigoryan, 2007) [16]. One of the key reasons contributing to the development of antibiotic resistance is the ease with which antibiotics may be purchased over the counter and without a prescription. As a result, patient and public education is the only approach to stop the spread of antibiotic resistance.

Antimicrobial resistance origin
Bacterial resistance to antibiotics is typically a natural adaptation to antimicrobial drugs. When bacteria develop an antibiotic resistance, they transmit this trait to their offspring either vertically or horizontally. New resistant bacterial strains that are somewhat more deadly than the original strain have emerged as a result of the illogical and indiscriminate use of

antibiotics. Nowadays, it is fairly usual for resistant bacteria to spread widely, which causes a number of health issues (Iwu MW, 1999) [17]. The genetic makeup of these resistant bacteria is changing so quickly that the potency of standard antibiotics may become ineffective in as little as five years (Bush K, 2004) [3].

According to a WHO (World Health Organization) assessment, bacterial illnesses that cause the majority of the world's fatal infectious bacterial infections, such as respiratory tract infections, diarrhoea, meningitis, syphilis, gonorrhoea, and tuberculosis, have higher rates of resistance (WHO, 2002) [36]. *Staphylococcus aureus* isolated from clinical samples is currently thought to be a multi-drug resistant bacteria because it has more than three drug resistances (Styers D, 2006) [29].

According to McEwen SA (2002) [25], antibiotics used in medicine are frequently identical to or similar to antibiotic compounds used in agriculture. This overuse of antibiotics may also promote drug resistance. The primary means by which antibiotic-resistant bacteria are spread from animal populations to human populations is through the food chain (Witte W, 1998) [34]. Animals consume antibiotics parenterally, in their food, and in their water, which may be to blame for the microorganism resistance to that particular antibiotic. Antibiotic resistance also rises as a result of antibiotics used as growth boosters in cattle feed (Levy SB, 1993) [21]. Given that one-fourth of youngsters were discovered to be faecal carriers of quinolone-resistant E. coli in the rural areas of Barcelona, recent data shows that poultry or pork may be a potential source of these bacteria. But quinolones were never given to these children (Garau J, 1999) [14].

AMR: Mechanism

Although the widespread use of these medications has considerably accelerated this process, AMR development in bacterial pathogens is an expected result of evolutionary adaptation to these toxic compounds (Devis J 2010). (Jonson, 2005). The production of antibiotic-degrading enzymes (such as lactamases), adaptation to alternative metabolic pathways (such as the metabolism of folic acid), target alteration (such as modifications to ribosomal subunits or the topoisomerase enzymes), deceased uptake of the drugs (such as outer membrane protein mutants), over-expression of efflux pumps, or the production of a protective exopolysaccharide matrix or biofilm are just a few ways that bacteria can evade (Olesen SW, 2018) [27].

Antibiotic Resistance Consequences

Superbugs are a class of bacteria, viruses, parasites, and fungi that are resistant to most antibiotics and other widely used drugs. These are no longer just a lab worry; they are now a major global menace that causes numerous fatalities and illnesses with a high mortality rate (Lipp EK 2002) [22]. AMR has a detrimental effect on health, leading to longer hospital stays and lengthier sickness treatments, greater mortality rates, higher medicine costs, and more strain on the healthcare system. Patients serve as a reservoir for resistant organisms that are spread to the general public and healthcare professionals, as well as having a significant negative influence on the economy.

If we do not take action to combat antibiotic resistance, a post-antibiotic period will result in frequent infections and even minor injuries could result in death (WHO, 2017) [38]. More deaths globally are being caused by multidrug resistant microorganisms. Every year, hospital-acquired bacterial illnesses claim the lives of more than 63,000 American patients (Aminov RI, 2007) [1]. Multiple drug resistance (MDR) bacterial infections are thought to be the cause of 25,000 patient deaths yearly in Europe (Freire ML, 2011) [12]. As a result of waves of clonal dispersion, nosocomial *Staphylococcus aureus* (*S. aureus*) infections are a problem in many nations. *Staphylococcus aureus* (MRSA) strains are rapidly proliferating around the world (Lowy FD2003) [23].

Most pharmaceutical corporations routinely distribute antibiotics, even though they may no longer be effective or don't have regulatory permission (Levy SB, 2004) [20]. Evidence suggests that while decreasing antibiotic use revealed lower resistance rates, increased antibiotic use may result in a positive connection with a higher prevalence of resistant microbes. Antibiotic resistance is more likely to occur in patients who have previously had antibiotic treatment (Laxminarayan R, 2001) [19]. Antibiotic use often or unreasonably promotes selective pressure on bacterial evolution. Antibiotic resistance is evolving due to the actions of both states and people. For example, Clarithromycin consumption and its resistance similarly increased fourfold in Japan between 1993 and 2000 in comparison to other countries (Perez AL, 2002) [28].

How is the crisis currently being handled

Top health organisations like the CDC and the WHO have acknowledged the antimicrobial crisis' existence and significance for the survival of the human race (WHO2014, CDC2013) [26]. These organisations' recommendations led to a number of initiatives and programmes created to deal with the AMR crisis. These activities can be divided into two categories: those that focus on illness prevention to decrease the need for antibiotics and those that offer novel or more effective treatments to either supplement or replace current antimicrobial medications. These efforts, in short, include immunisation, public awareness campaigns, clinical education, and the recommendation of legislative action. It is also recommended to use diagnostics for microbial identification and microbial sensitivity testing to existing antibiotics to control diseases quickly and effectively (WHO 2014) [26]. The health of the target groups has been improved by all of these activities. However, if resistant microbial infections are to be contained, these precautions should be increased and additional measures should be put in place given the rising prevalence of infections resistant to antimicrobial therapy.

The Worldwide Action Plan on AMR was approved by the 68th World Health Assembly in 2015 to address this global challenge (WHO 2015). The five strategic actions in this action plan are: (1) raising awareness and knowledge of AMR; (2) stepping up AMR surveillance; (3) lowering the incidence of infections; (4) maximising the use of antibiotics; and (5) creating a business case for AMR control. Through a collaborative process, WHO created a priority pathogens list (PPL) to assist the Global Action Plan (WHO2017) [38]. Multi-criteria decision analysis (MCDA), which incorporated data from several sources, including illness mortality, transmissibility, treatability, health care burden, preventability in health care settings, and preventability in community settings, among other things, was used to determine the priorities.

Conclusion

One of the biggest problems in human medicine today is AMR. It is at an all-time high everywhere in the world. Despite actions made by some WHO members, the use of antibiotics in humans, livestock, and agriculture is rising. Due to prolonged hospital stays, isolation wards, strict infection control procedures, and treatment failures, the high financial load on the healthcare industry has become a pressing concern. The leaders in public health should create a global surveillance system that is coordinated at the national and international levels, ongoing analysis, and a required reporting system for antibiotic resistance. To stop the overuse and abuse of antibiotics, it is necessary to comply to both domestic and international rules.

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