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Opinion

Antimicrobial resistance: The next probable pandemic

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Abstract

Even as the world continues to grieve for those lost to the SARS-CoV-2 pandemic, another pandemic is brewing that has the potential to kill hundreds of millions of people in a century or less. In the far future, patients' lives are being cut short in hospital wards by the stealthy but widespread epidemic of antimicrobial resistance. Unfortunately, the global health community is now confronting the silently growing pandemic that could threaten some of the most significant advancements in contemporary medicine. Considering that current medical professionals will eventually pass the torch to their students, who will hopefully lead to further improvements in antimicrobial resistance and antibiotic usage, medical students have the opportunity to contribute to a long-term solution to this problem. Future medical professionals, then, need to be better equipped to make prudent and economical use of antimicrobials.

Introduction

Antimicrobial Resistance (AMR) is the inability of bacteria, viruses, or fungi to respond to antimicrobial drugs. Antibiotics and other antimicrobial medications lose their ability to fight infections as a result of drug resistance and treating infections thereafter becomes increasingly challenging or even impossible. (https://www.uicc.org/what-we-do/areas-focus/antimicrobial-resistance-amr)

The rise and spread of drug-resistant pathogens that have acquired new resistance mechanisms, leading to antimicrobial resistance, continues to undermine our capacity to treat common diseases. This resistance is caused by the acquisition of novel resistance mechanisms by drug-resistant pathogens. The rapid global expansion of multi- and pan-resistant bacteria, commonly known as "superbugs," which cause diseases that cannot be treated with conventional antimicrobial medications such as antibiotics, is particularly concerning. These bacteria cause infections that cannot be treated with existing antimicrobial drugs [1].

The World Health Organization (WHO) identified 32 antibiotics in clinical development in 2019 that address the WHO list of priority infections; however, only six of these antibiotics were considered to be innovative. In addition to this, there is still a significant problem with limited access to antimicrobials of sufficient grade. Antibiotic shortages are having an impact on countries at all stages of development, particularly on the healthcare systems of these nations [2].

The global rise of antibiotic resistance, is leading to illnesses that are harder to cure and ultimately leading to death. There is an immediate demand for the development of new antibacterial drugs, such as those that can treat infections caused by carbapenem-resistant gram-negative bacterial strains, which are on the WHO priority pathogen list. If individuals do not adjust the way they take antibiotics now, however, these novel medications will suffer the same fate as the existing antibiotics and become ineffective [3].

Illnesses that are untreatable or fatal in more people will continue to rise unless we have better methods for preventing and treating drug-resistant illnesses and more widespread access to current and future quality-assured antimicrobials. Medical operations such as Caesarean sections, hip replacements, chemotherapy for cancer and organ transplants will all carry greater risks.

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Immediate action and prevention are required

There are no words to adequately express the threat that AMR poses to both human and animal health as it continues to arise and spread. By 2050, it is expected that AMR would be a leading cause of death, surpassing even cancer.

Methods of prevention include:

AMR will be reduced along with childhood morbidity and death. Improving vaccination services, providing safe water, improving sanitation, decreasing environmental pollution, and encouraging hand hygiene, breastfeeding, and nutrition are the main measures [4].

- Antibiotics should only be consumed when prescribed by a certified health professional
- Avoid intimate contact with sick people, engage in safer sex and stay up-to-date on your vaccines to prevent infections
- The healthcare industries should invest in research and development of new antibiotics, vaccines, diagnostics, and other tools
- Needs better monitoring of antibiotic resistance to prevent outbreaks
- Antibiotics should only be prescribed and dispensed by health professionals when absolutely necessary
- Healthcare-acquired diseases including CLABSI (Catheter-Related Bloodstream Infection), HAP (Healthcare-Associated Pneumonia), CAUTI (Catheter-Related Urinary Tract Infection) and SSI (Surgical Site Infection) can be avoided with the help of prevention bundles
- Environmental infection control policies (air, water and surfaces)
- Isolation policies include contact isolation for patients colonized/ infected with carbapenem-resistant pathogens, MRSA, and VRE (Vancomycin-Resistant Enterococci).
- Should report antibiotic-resistant infections
- Animals should only be given antibiotics under a veterinarian's care [5]

The Hospital-Based Antimicrobial Stewardship Program (AMSP)

Hospital accreditation now requires an AMSP. The International Committee of Medical Reviewers and the Infectious Disease Society of America have both issued extensive criteria for establishing AMSP [6,7]. Furthermore, guidelines for establishing a pediatric AMSP have been written up [8]. Antimicrobial stewardship teams are usually led by a clinical microbiologist, an infectious disease expert, or a physician or paediatrician who is interested in infectious diseases. Besides the hospital's IT representative, the team also includes a clinical pharmacist/pharmacologist, nurses specializing in infection control, quality managers and a clinical nurse specialist. The AMS committee has the backing of surgeons, critical care physicians, emergency medicine experts and hemato oncologists. To maintain the program's longevity and efficacy, the core team should be held to account for stewardship efforts and compensated for their time spent on these tasks.

The development of infection-specific guidelines, including those for community-based infections, surgical prophylaxis and healthcare-associated infections, is the following stage. The local antibiogram should serve as the foundation for the HAI guidelines, which should be continuously updated. Culture methodologies, empiric therapy selection, additional therapy modification, escalation, and de-escalation, as well as antimicrobial dose and duration, should all be included in all treatment guidelines. Seminars, posters, pamphlets, and even smartphone-based applications can help get the word out once the guidelines have been finalized and sent to the relevant parties. Frequent quizzes and games with incentives should be used to test students' understanding of the AMS program.

The programme includes an audit of antimicrobial use. There are two such tactics. The first is a front-end strategy in which a high-end antibiotic prescription requires clearance from a clinical microbiologist/infectious disease specialist. This is not the recommended technique, however, because it may be impossible to withhold high-end antibiotics from a critically ill patient, and it has had poor acceptance. As a result, the most widely used strategy is a back-end strategy. A stewardship committee audits the usage of some high-end antibiotics (e.g., polymyxins, antifungals) after 48 hours - 72 hours following the prescription. The antibiotic is justified by the committee based on clinical details, culture results, and response to therapy. This choice is communicated to the doctor and a decision to continue or discontinue the antibiotic is reached by consensus. The acceptance of the back-end technique is higher, despite the fact that it is more labor intensive [9].

In addition to the hospital-established programme, it is advised that all paediatric and neonatal units establish their own internal stewardship programme to manage antibiotic usage.

New generations require education and exposure

Considering the impact of one's early education on their future success, it is crucial that medical students learn about global health challenges like AMR as early as possible in their academic careers. Hence, medical school educators and practitioners alike require the ability to spot and address curriculum blind spots in light of future demands. In addition, students at all levels of education should participate in an Antibiotic Resistance Program (ASP) to learn about the latest developments in resistance and the medication sensitivities of various organisms. Antimicrobial sensitivity can be properly addressed by such a program. Once they have reached the necessary level of expertise, students can contribute to the

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education of their peers in medical schools by teaching courses. Medical students can play a significant role as educators and advocates in their communities, in addition to fostering change in their institutions of higher learning and healthcare facilities. Doctors, scientists, and other experts can pool their resources to organize a forum devoted to educating colleagues and establish a group to further investigate fundamental challenges in the field. The Coalition for the Fight Against Antimicrobial Resistance is one such group operating in Nepal (AAAMR). Since its inception, AAAMR has collaborated with aspiring doctors and nurses to promote public and professional understanding of Autism Spectrum Disorder (ASD). Students at medical schools who participate in such groups are more likely to do original research that will lead to a more nuanced approach to prescribing antimicrobials in the future [10-16].

Conclusion

Being able to use effective antimicrobials is a huge plus for human longevity, health and the other positive outcomes of contemporary medicine. Antibiotic treatment for a variety of infections has become standard practice. Without the ability to treat or prevent infections with antibiotics, even the simplest wound care procedures would pose significant risks to the patient. These procedures include surgery, cancer therapy, intensive care, transplant surgery and simple wound maintenance. The overuse and improper disposal of antimicrobials can quickly increase the prevalence of drug-resistant bacteria, reducing the effectiveness of these medicines. Therefore, it is time for us to wake up to the gravity of the situation and unite in the fight against superbugs. We are in the midst of an "antimicrobial resistance" crisis. There aren't many new medications in development, and our supply of therapeutic alternatives is running out. If we don't make good use of the antibiotics we now have, we'll go back to a time when common infections were impossible to treat.

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