

SHORT COMMUNICATION

Understanding Antimicrobial Resistance with perspective of One Health

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ABSTRACT

The concept of "One Health" recognizes the intrinsic relationship among health of human, animal and environment as a whole. All facets of One Health are undermined by the irrational use of antimicrobials and AMR cannot be effectively contained without coordinated actions of all key stakeholders including community participation.

Introduction

Antimicrobial Resistance is an emerging public health menace faced by developing nations like India. According to the World Health Organization, it is one of the most serious threats to public health globally¹. The worst affected nations by the AMR are those with lower middle incomes countries. AMR caused 495 million deaths worldwide in 2019. In a developing nation like India which accounts the significant rising burden of bacterial infections; AMR undoubtedly poses a major threat as approximately 25% of all child fatalities occur due to pneumonia, which kills 417 per lakh children under the age of five every year.² Tackling AMR can't be possible if we keep concentrating exclusively on human health rather we should understand and focus on concept of One Health to combat the global burden of AMR^{1,2}.

The essence of "One Health" recognizes the intricacies of relationship among human health, animal health and the health of the environment in a holistic manner³. Almost 70% of antibiotics are used in the animal industry for therapeutic purposes in the health care industry. The resistance has made its way to the whole food chain which is evident by the fact that the resistance is not only restricted to older drugs but also affects newer drugs like Colistin which is considered to be one of the last resorts. This growing resistance among all components of One Health poses a threat to the whole ecosystem. Hence to achieve an optimal level of health for humans, animals, and the environment a multisectoral and transdisciplinary approach is necessary⁴.

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AMR and dimensions of One Health:

A report published in 2016 by Food and Agriculture Organization (FAO) states "there is a substantial body of evidence to support the view that the emergence of antibiotic resistance in bacteria found in livestock populations is associated with the emergence of AMR in bacterial populations that colonize and infect humans".

AMR and Humans

Irrational use of antimicrobials in healthcare sectors result in emergence of resistance in microbes. This leads to paucity of treatment options available in the system which contributes to major morbidity and mortality among hospitalized patients.

AMR and Animals

The impact of AMR on livestock is poorly reported in India. Medically important antibacterial agents such as Tetracycline and Macrolides are used for prevention, control, and treatment of diseases apart from growth promotion in animal product based industries such as dairy, poultry, and aquaculture⁵. Eventually these products are consumed by humans and a vicious cycle tends to escalate AMR in the food chain. Studies conducted have often shown that germs isolated from animals or shellfish exhibit high levels of resistance. The rise of AMR from antibiotic abuse in the animal sector is expected to be an undefined burden in India given that there are few restrictions against the use of antibiotics for non-therapeutic purposes, with no stringent implementation of regulations. Since antibiotics are frequently administered as a growth booster hence it's challenging to determine the exact consumption levels of antibiotics in the different industries⁶.

AMR and Environmental Health

With the advent of industrialization, all the natural sources continue to deplete their real essence. Now they are loaded with resistant, toxic effluents due to indiscriminate use of pesticides, and insecticides. Improper waste management results in reduced soil quality such as poor fertility². Additionally, a potential danger to food security is the emergence of several resistant microbial species in soil. Untreated medical and non-medical waste is released into the air, water, and land due to improper household, pharmaceutical and industrial waste management and poor infection control procedures. As a result, pathogens that are resistant propagate across the ecosystem⁷. Promoting rational antimicrobial use, reducing the extensive dependency of antimicrobials across all sectors and implementation of "upstream" solutions like "reduce, reuse, recycle" through various stakeholders will help to curtail emerging antimicrobial resistance in the environment.^{7, 8}

Challenges for implementing One Health to contain AMR in different sectors^{8, 9}

- Lack of cooperation & poor data sharing among various sectors.
- Lack of institutional collaboration.
- Inadequate monitoring of consumption of antimicrobials in animal and environmental sector.
- Poor community participation out of knowledge and awareness
- A weak legal foundation for implementation of regulations
- Insufficient budget allocation

Initiatives taken by the Government of India towards one health and its relevance to AMR

- The National One Health Programme for Prevention and Control of Zoonoses was introduced during the 12th five-year plan with the goal of strengthening inter-sectoral coordination.¹
- A Bio Safety Level IV (BSL) laboratory will be accommodated at the upcoming National Institute of One Health in Nagpur.^{1,2}
- In an effort to prohibit the usage of Colistin as a growth promoter in animal feeds, the Indian Council of Agriculture Research (ICAR), the Division of Animal Husbandry, Dairy, the Drug Controller General of India (DCGI) and the Indian Council of Medical Research (ICMR) have initiated collaborative approach.⁸
- Thus the government is encouraging interdisciplinary collaboration between humans, animals and the environment where antibiotic resistance, food safety, and zoonotic diseases (both new and re-emerging) are major areas of focus.
- Based on the recommendations of ICMR and better understanding from various reviews we would like to encourage the following public health strategies to contain AMR from the lens of One Health.¹⁰
- The Antimicrobial Stewardship Program (ASP) is an important strategy for preventing the emergence of antimicrobial resistance; however cooperation of community, pharmaceuticals and healthcare providers are essential for its effective implementation and minimize barriers.
- Promoting sustainable agriculture over conventional farming methods such as organic farming will reduce expenses and the overuse of synthetic fertilizers and pesticides.
- In order to reduce the burden on the livestock industries and meet the expectations of a growing population, it is essential to increase knowledge about sustainable eco friendly alternatives.
- To ensure that habitat of domestic animals must be hygienic and diseases free to minimize the use of antimicrobials.
- Utilize effectively Information Education and Communication (IEC) at grassroots level to enhance awareness and understanding of AMR among the general population and its fatal health repercussions on the entire ecosystem.
- Nonetheless, the basic sanitation and hygiene practices must be disseminated among every household in such a way that it ultimately become a part of human consciousness.
- To limit the spread of harmful substance in the environment; The *Swachh Bharat Mission* 2014 should be implemented efficiently.

Conclusion

It is evident that AMR cannot be eradicated; only containment is the best way to prevent its spread to different dimensions of One Health. Most government departments including Health and Family Welfare, Agriculture/veterinary and environmental agencies have traditionally operated in isolation with separate mandates and budget allocations. However, collaborative efforts among these sectors are required to implement the concept of One Health in order to combat AMR¹⁰

Way Forward:

Nation like Denmark , Sweden , Netherland have been working proactively to bring AMR at national front rather it remains a highly neglected area in low and middle income countries hence regulation of antimicrobials should be adopted by all stakeholders with legislative support to prevent the further spread of resistance for sustainable development¹¹.

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