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ROLE OF ENVIRONMENTAL CONTAMINANTS AND OTHER ENVIRONMENTAL FACTORS IN THE SPREAD OF ANTIMICROBIAL RESISTANCE IN AFRICA: PLANETARY HEALTH AS A PANACEA – SHORT COMMUNICATION

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ABSTRACT

Misuse and overuse of antibiotics have contributed to increased resistance in superbugs which is identified as a public health threat across the globe. Currently, antimicrobial resistance is estimated to cause 700,000 deaths per annum worldwide, and in 2050, about 10 million lives will be lost, of which 41.5% will occur in Africa, being the most vulnerable behind Asia due to limited surveillance, lack of information on emerging resistant strains, and ineffective coordinated approach among others. However, considering the prevalence nature of antimicrobial resistance in Africa, its magnitude is not fully understood in the context of the environment, and little attention has been placed on the role of environmental contaminants and other environmental factors in promoting resistance. This paper, therefore, elucidates some environmental factors and contaminants that contribute to the spread of resistance in Africa and recommends a planetary health approach as a panacea.

Keywords: Antimicrobial Resistance, Africa, Planetary Health, Environment, Antibiotics

INTRODUCTION

Antimicrobial resistance (AMR), the ability of microorganisms to withstand and grow in the presence of medications used to inhibit their growth or kill them, is one of the leading threats to global public health, and it is currently estimated to cause about 700,000 deaths per annum worldwide **(World Health Organization, 2019)**. According to a 2014 review on antimicrobial resistance, if appropriate measures are not taken to salvage this situation, about 10 million lives will be lost to AMR by the year 2050—an estimated death greater than cancer **(O'Neil, 2014)**. Africa, being the second most vulnerable behind Asia (47.3% AMR estimated deaths), will experience about 41.5% deaths owing largely to lack of well-established health policy and action plan needed to control the risk of antimicrobial resistance, thus—an issue of public health concern **(O'Neil, 2014)**. In an environmental context, which has gained less attention, literature reviews have shown environmental compartments including soil, air, and water, not only as sources of antimicrobial-resistant microbes but also play an important role in their dissemination **(Kimera *et al*, 2020)**. Therefore, preserving the African continent from the estimated death and reducing its rush to the post-antibiotic era, requires a "planetary health" approach.

According to Zhu and colleagues, the problem of antimicrobial resistance is associated with environmental contaminants. Households, clinical, and pharmaceutical antimicrobial resistant determinants are commonly discharged into the waste-water treatment plants where they are poorly treated; the released effluent carries these antimicrobial-resistant determinants as contaminants into the environment where antimicrobial resistance genes are stressed through anthropogenic activities like farming and irrigating with reclaimed effluent **(Zhu *et al*, 2019)**. This challenge is very common in resource-limited settings like developing African countries with suboptimal sewage systems, poor healthcare infection control practices, and poor sanitation practices **(Alvarez-Uria *et al*, 2016)**, thus, contributing to the increased spread of resistant-microbes in this region. Additionally, contaminants like heavy metals can persist for long periods in the environment where they create additional pressure on antimicrobial-resistant microbes, as well as induce co-selection of antimicrobial resistance genes, thereby, posing a threat to public health through aggravating the effect of antimicrobial resistance (**Dikinson *et al*, 2019**).

Human activities in the African region such as agricultural practices and mining, contribute greatly to the creation of the Anthropocene era, and this has caused changes in the Earth's natural systems (**Tajudeen *et al*, 2021**). One of the environmental effects from this is the drastic rise in Earth's temperature expected from climate change—which has been linked with increased antimicrobial resistance in pathogenic microbes in a study by **MacFadden and colleagues (2018)**. Unfortunately, details of how temperature affects AMR distribution only appeared in few papers, and this calls for more studies. However, it is no doubt that the African continent lacks the adaptive measures to mitigate the effect of climate change, thus, at great risk of antimicrobial resistance.

These prevailing challenges of environmental contaminants and other environmental factors linked with antibiotics resistance is a complex phenomenon needing the adoption of a holistic approach like planetary health involving the input from the government and relevant stakeholders. However, the concept of planetary health view human health from the perspective of diverse interrelated fields, as it focuses largely on how human health and civilization affect the Earth's natural systems while its approach offers clarity in understanding the relationship between human health and the environment (**Oladunjoye *et al*, 2020**).

CONCLUSION

In conclusion, adopting this approach will not only save the African continent from the predicted risk of AMR but also serve as a means to understand environmental contaminants and other environmental factors in promoting resistance. Collaborative research aimed at studying the relationship between antimicrobial resistance and environmental contaminants including other environmental factors should be conducted amongst researchers/experts from inter-related disciplines e.g. microbiologists, public health scientists, environmental health scientists, ecologists, and veterinarians under the platform of planetary health. There is also a need for strengthening national policy aimed at regulating antibiotics consumption and discharge in the natural environments, and an integrated risk assessment framework to minimize human-environmental health risks. Consequently, public education and continuous advocacy across the African continent on the need for antimicrobial resistance inclusion in the agenda of planetary health is highly recommended, while politicians, relevant stakeholders, and key decision-makers need to be enlightened on the importance of this approach since its implementation requires huge funding and strong political will.

Conflict of interest: The authors declare no conflict of interest.

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