
LETTERS TO THE EDITOR**Climate Change – An Emblematic Driver of Vector-Borne Diseases: Holistic View As A Way Forward**Yusuf Amuda Tajudeen¹ & Iyiola Olatunji Oladunjoye¹¹ Department of Microbiology, Faculty of Life Sciences, University of Ilorin, Nigeria* Corresponding Author: Iyiola Olatunji Oladunjoye, Email: iyiolaoladunjoye@gmail.com

Abstract

Vector-Borne Diseases (VBDs), including malaria, arboviruses, Lyme diseases, leishmaniasis and many others, have become an important public health threat across the globe due to rapid climate change. This is due to the alteration of the geographical distribution of vectors, which in turn amplify the spread of diseases. In this article, we highlight climate change as an emblematic driver of vector-borne diseases, as well as explicate its positive correlation with the increased prevalence of vector-borne diseases, citing relevant studies as evidence. Consequently, we recommend that researchers from different disciplines, including ecologists, metagenomics and modeling experts, climate scientists, microbiologists, wildlife experts, entomologists, public health scientists, social scientists, religious and community leaders, legal practitioners, and policy-makers, should work together under the One Health approach supported by government and political leaders to mitigate the global threat of vector-borne diseases.

Key words: Climate Change, One Health, Vector-Borne Diseases, Zoonoses, Public Health

Vector-Borne Diseases (VBDs), including malaria, arboviruses, Lyme diseases, leishmaniasis, and many others, have become an important public health threat across the globe. This is due to rapid climate change altering the geographical distribution of vectors, which in turn amplify the spread of diseases. It has been estimated that VBDs account for more than 17% of the global communicable disease burden and >700,000 deaths are reported from VBDs per annum across the world [1]. The World Health Organization defines VBDs as human diseases caused by pathogens such as viruses, bacteria and parasites that are transmitted naturally by vectors [1]. The geographical distribution of vectors and disease transmission dynamics is associated with their level of sensitivity to climate change [2]. Perturbations in temperature, caused by variability in climate change, have been reported in several studies to facilitate the fecundity, frequency for blood meals, extrinsic incubation period, breeding and competence of vectors that can drive the spread of diseases [3]. Consequently, other non-climatic factors such as urbanization, land-use change, habitat encroachment and human migration have escalated the distribution of invasive vector species and emergence of novel pathogens in the human population [3,4]. However, the prevailing health threat that VBDs pose to human health and well-being in the 21st century can best be addressed from a holistic view, like the One Health approach.

The prevalence of VBDs has been associated with increased anthropogenic activities, such as urbanization,

land-use change and habitat encroachments, leading to rising global temperatures and extreme weather conditions like intense precipitations and droughts closely connected to El Niño and La Niña events from climate change. As estimated by the Intergovernmental Panel on Climate Change (IPCC), the global mean temperature will rise by 1.5°C above pre-industrial levels between 2030 and 2050 [5]. If adequate measures are not taken to salvage this situation, it could result in increased population density of vectors and high rates of VBDs epidemics in the human population. Additionally, this projected temperature tends to alter the geographical distribution of vectors such as mosquitoes, ticks and sandflies, including the diseases transmitted by these vectors, due to the non-linear effect of temperatures on them. This is because vectors are ectothermic, making them very sensitive to ambient temperature changes which play an essential role in their transmission cycles [10]. Increased temperature favors the competence, fecundity, and frequency of blood meals of important mosquito species such as *Anopheles*, *Aedes aegypti*, and *Aedes albopictus*. This, in turn, facilitates the global transmission of malaria diseases, and medically important arboviruses such as Chikungunya, Dengue and West Nile viruses respectively [4]. Ticks and sandflies associated with the transmission of Lyme diseases and leishmaniasis have also been reported to be highly active at higher temperatures, leading to increased global transmission of the diseases they are transmitting [4]. Intense hydrometeorological

conditions, such as heavy rainfall and precipitation, can facilitate high population density of vectors, enhance VBDs circulation, and increase the outbreaks of VBDs, owing to the abundance of rain-filled containers and tires (breeding habitat of vectors) in an unsanitary environment where vectors can lay their eggs [6].

Several studies linking the spread of VBDs with climate have been well documented. The prevalence of malaria vectors in some endemic areas in Paraguay to Argentina have been associated with heavy rainfall from the 1991-1992 El Niño—Southern Oscillation [7]. The spread of dengue virus in Singapore over the last 40 years has also been linked with increased temperature favoring the distribution of arboviral vectors [8]. A positive correlation of *Leishmania tropica* activity with increased ambient temperature in the Eastern Mediterranean region has been established by Yoni and colleagues [9]. This prevailing evidence establishes climate change as an emblematic driver of vector-borne diseases and the immediate inclusion of vector-borne diseases in the agenda of One Health.

We therefore recommend that researchers from different disciplines, including ecologists, metagenomics and modeling experts, climate scientists, microbiologists, wildlife experts, entomologists, public health scientists, social scientists, religious and community leaders, legal practitioners, and policy-makers, should work together under the One Health platform supported by government and political leaders to mitigate the global threat of vector-borne diseases. Development of global vector control response in the framework of One Health is highly recommended.

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Conflict of Interests

None.

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