

The Impact of Climate Change on the Spread of Viruses and the Emergence of New Diseases

Amjed Mohammed Sahib¹, Marwa Ahmed Meri², and Zainab Mohammed Madfoon

¹ Directorate of Education in AL-Najaf, Ministry of Education, Iraq

² Najaf Education Directorate, Open College of Education, Study Center in Najaf, Iraq.

³ Biology Department, College of Science, University of Kufa, Iraq.

*E-mail: amjed.almusawi89@gmail.com , marwaahmedmeri@gmail.com,
zainabm.algeubori@uokufa.edu.iq

Abstract

Background: The planet faces an unprecedented climate change because global temperatures have risen heavily, while rainfall patterns have shifted. The occurrence of extreme events like hurricanes droughts, along with floods has significantly increased. All aspects of economy and health, and ecology remain susceptible to serious threats as a result of climate changes. The article discusses why urbanization, together with degraded ecosystems, heightens disease transmission risks, then provides guidelines to enhance ecosystem management and strengthen health surveillance systems.

Conclusion: The public health stands at serious risk because climate change modifies infectious disease zones and boosts the chances of zoonotic virus transmission, and generates new health threats. Health surveillance systems need strengthening while ecological management needs improvement together with better public health education to mitigate these risks. Additional scientific research along with international collaboration needs more financial support to create proper solutions against health problems from climate change.

Key words: Viruses,, Climate Change , Spread of Viruses , Diseases.

Article Information

Received: January 30, 2025; Revised: February 28, 2025; Online: March 2025.

INTRODUCTION

The planet faces an unprecedented climate change because global temperatures have risen heavily while rainfall patterns have shifted. The occurrence of extreme events like hurricanes droughts along with floods has significantly increased. All aspects of economy and health, and ecology remain susceptible to serious threats as a result of climate changes. Scientific studies conducted by the Intergovernmental Panel on Climate

Change (IPCC, 2021) shows that human actions through greenhouse gas emissions lead to these changes by releasing carbon dioxide and methane. The detected health problems and environmental deterioration produced by these transformations led to more infectious disease outbreaks and the generation of modern diseases. Studies now focus on how climate change influences virus transmission and disease formation because this connection

has recently emerged as an important scientific research subject.

Research shows that infectious diseases will modify their geographic range because of global warming, thus creating conditions for virus transmission between animal reservoirs and human populations, as well as the development of novel, unidentified illnesses. For example, a study in the journal *Nature* revealed that increasing temperatures may allow mosquitoes that spread diseases like malaria and dengue fever to spread into previously uninhabitable cold regions (Rocklöv & Dubrow, 2020). Furthermore, locations that frequently flood may see an increase in mosquito populations as a result of altered rainfall patterns. This makes vector-borne illness transmission more likely (World Health Organization [WHO], 2020).

Global warming may also make it more likely for viruses to spread from animals to people, a phenomenon called "zoonotic transmission." Animal interactions with humans may increase as a result of environmental changes that compel them to relocate to new places in search of food and refuge. Humans remain at risk of transmitting viral infections from animals due to enhanced human-animal interactions which led to the Ebola virus spread according to Jones et al. (2008) and the COVID-19 coronavirus emergence. Ice melting in the Arctic could result in dangerous viruses buried for millennial years becoming active thus posing a new risk to human civilization (Revich & Podolnaya, 2011).

The following article explores virus transmission processes caused by climate change alongside disease origin reasons and scientific solutions to minimize risks. The article discusses why urbanization together with degraded ecosystems heighten disease transmission risks then provides guidelines to

enhance ecosystem management and strengthen health surveillance systems.

Climate Change and Its Impact on Ecosystems

Rising Temperatures

Climate change produces global warming as an essential impact of its operations. Studies conducted by the Intergovernmental Panel on Climate Change show that world temperature has grown by 1.1 degrees Celsius when compared to pre-industrial times. The IPCC (2021) forecast further emission of greenhouse gases unless we immediately reduce emissions (IPCC, 2021). Temperature increases directly impact ecosystems to reshape species distributions, especially by moving disease-infected bugs such as ticks and mosquitoes.

Changing Rainfall Patterns

Regional rainfall patterns keep transforming under climate change impacts because certain areas receive increased rainfall but others face severe drought conditions. These modifications of the environment produce disease-carrying insect breeding grounds while affecting fresh water availability and increasing flood risks. Anticipated flood conditions create more mosquito habitat which then leads to disease transmission of dengue fever and malaria (World Health Organization [WHO], 2020).

Melting ice and rising sea levels

Health risks affected by climate change include melting polar ice in addition to elevated ocean levels. The thawing process of ice will activate viruses which have been frozen in place for multiple millennia. Humanity might encounter a fresh danger because of these conditions. Rising sea levels would force coastal inhabitants to relocate creating more population density inside cities

alongside greater risks of infectious diseases (Patz et al., 2005).

The Impact of Climate Change on the Spread of Viruses

Changing Distribution of Infectious Diseases

Temperature and humidity changes due to climate change alter the distribution of infectious diseases because they create new conditions for illness transmission in specific areas.

Mosquitoes which transmit diseases like malaria and dengue fever now colonize previously unsuitable areas because of temperature elevation (Rocklöv & Dubrow, 2020). The alteration of rainfall patterns in flood-prone areas can lead to higher mosquito numbers in those regions. Animals now have higher probabilities to transmit viral infections to human populations

Climate change raises the risk that viruses will transit from animals to humans through zoological transmission. The shifting ecosystems make animals relocate for food and shelter purposes thus raising their contact frequency with human populations. Human beings face an increased risk of viral transfer from animals to their population because of boosted human-animal interactions, according to Jones et al. (2008) when studying COVID-19 and Ebola virus cases.

Emergence of New Diseases

Climate change will create new unknown diseases which may occur. Changes in environmental conditions enable new viral infections while existing viruses develop stronger human-transmissible qualities. Melted Arctic ice may release old viruses that remained trapped in ice for thousands of years

thereby creating a new threat for human civilization (Revich & Podolnaya, 2011).

Factors that contribute to the increased risk of virus spread

Urban expansion and overpopulation

Two key climate change factors including urbanization and overcrowding act to increase viral transmission risks. The combination of rising sea water and rising frequency of natural disasters will drive more people into cities leading to deteriorating living standards while simultaneously causing increased congestion. Infectious disease transmission becomes easier when maintaining clean water and sanitation operations grows challenging (McMichael, 2013).

Ecosystem Degradation

The degradation of ecosystems resulting from climate change tends to increase the probability of virus transmission. The destruction of natural habitats compels animals to relocate thus heightening their chances to transmit viruses between people. Environment degradation leads to reduced biodiversity which limits the ability of ecosystems to stop disease transmission (Keesing et al., 2010).

Malnutrition and Weakened Immunity

Two significant climate change effects which enhance human risk for infectious diseases include malnutrition and immune system weakness. Plants will produce less food because droughts become more common and rainfall falls differently across the region leading to nutrition deficits and starvation conditions. The impairment of immune function that comes from malnutrition makes people more susceptible to acquiring infectious infections (McMichael et al., 2006).

Scientific recommendations to reduce the risk of viral spread

Strengthening health surveillance systems

Health surveillance systems need improvements in their disease identification capabilities so healthcare staff can discover infections before viral spread happens in climate change scenarios. Better data collection systems, improved analytics and increased funding for health infrastructure together with medical staff training on new illness detection are needed (WHO, 2020).

Improving ecosystem management

Improving ecosystem management stands as a tool to lower virus spread risks. Sustainable practices require the protection of natural lands together with biodiversity improvement and deployment of ecosystem preservation methods. Improving international collaboration presents a necessary solution for managing standard environmental and health matters according to Keesing et al. (2010).

Health awareness and education

Uncontrolled viral spread depends substantially on education together with health awareness programs. Public education about climate change dangers to health must be combined with guidelines for stopping mosquito-borne disease transmission and ensuring sanitary water control (McMichael, 2013).

CONCLUSION

The public health stands at serious risk because climate change modifies infectious disease zones and boosts the chances of zoonotic virus transmission and generates new health threats. Health surveillance systems need strengthening while ecological

management needs improvement together with better public health education to mitigate these risks. Additional scientific research along with international collaboration needs more financial support to create proper solutions against health problems from climate change.

REFERENCES:

1. Intergovernmental Panel on Climate Change (IPCC). (2021). Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press.
2. Jones, K. E., Patel, N. G., Levy, M. A., Storeygard, A., Balk, D., Gittleman, J. L., & Daszak, P. (2008). Global trends in emerging infectious diseases. *Nature*, 451(7181), 990-993.
3. Keesing, F., Belden, L. K., Daszak, P., Dobson, A., Harvell, C. D., Holt, R. D., ... & Ostfeld, R. S. (2010). Impacts of biodiversity on the emergence and transmission of infectious diseases. *Nature*, 468(7324), 647-652.
4. McMichael, A. J. (2013). Globalization, climate change, and human health. *New England Journal of Medicine*, 368(14), 1335-1343.
5. McMichael, A. J., Woodruff, R. E., & Hales, S. (2006). Climate change and human health: present and future risks. *The Lancet*, 367(9513), 859-869.
6. Patz, J. A., Campbell-Lendrum, D., Holloway, T., & Foley, J. A. (2005).

- Impact of regional climate change on human health. *Nature*, 438(7066), 310-317.
7. Revich, B., & Podolnaya, M. A. (2011). Thawing of permafrost may disturb historic cattle burial grounds in East Siberia. *Global Health Action*, 4(1), 8482.
8. Rocklöv, J., & Dubrow, R. (2020). Climate change: an enduring challenge for vector-borne disease prevention and control. *Nature Immunology*, 21(5), 479-483.
9. World Health Organization (WHO). (2020). Climate change and human health: risks and responses. World Health Organization.