



AMERICAN JOURNAL OF ENVIRONMENT AND CLIMATE (AJEC)

ISSN: 2832-403X (ONLINE)

VOLUME 1 ISSUE 3 (2022)



PUBLISHED BY: E-PALLI, DELAWARE, USA

Role of Climate Change During the Covid-19 Pandemic

Salum Haji Hamisi^{1*}, Abdillahi Mussa Kitota²

Article Information

Received: October 13, 2022

Accepted: November 13, 2022

Published: November 27, 2022

Keywords

Climate Change, COVID-19, Pandemic, Weather and Climate

ABSTRACT

Climate change has become a topic of concern around the world. Many aspects of human well-being are affected by climate change. The social, economic, political, ecological and cultural development was influenced directly or indirectly. This paper has examined the role of climate change during the current period of the COVID-19 pandemic. The documentary analysis method was chosen. Various books, research reports, WHO databases and internet sources have been used extensively. Various literature shows that climate change may have played a significant role in the widespread effects of the COVID-19 pandemic. COVID-19 affects people with compromised immunity. The weakened immunity results from some diseases and treatments that weaken the body's immunity. These include chronic lung diseases such as chronic asthma, some cancers, high blood pressure (hypertension), HIV / AIDS, and some developmental diseases. As a result, people become vulnerable to COVID-19. Poor diet also causes people to have weak immunity and become less resistant to the coronavirus. Poor nutrition results from changes in the climate pattern; Unavailability of sufficient and high-quality food, low production of sufficient food, and inaccessibility of high-quality food due to poverty. The world must take serious steps to stop excessive greenhouse gas emissions. If not, the human species will die as new diseases and viruses will emerge to take our lives as COVID-19 did.

INTRODUCTION

Climate change has preoccupied the world for several years. It is a slogan along with poverty alleviation, environmental problems and security. It is a very ancient phenomenon that was observed on the surface of the earth when humans made advances in terms of technological development. Climate change is defined as a climate change that is directly or indirectly attributed to human activities that change the composition of the global atmosphere and that, in addition to natural climate variability, are observed over comparable periods (Patz *et al.*, 2015).

It has been found that the sun emits the sun rays, which pass through the electromagnetic spectrum, which is made up of ultraviolet and infrared. Scientists agree that 1/3 of solar radiation is reflected from the atmosphere and the earth's surface and 2/3 is absorbed by water (Romm 2016). Increasing land use and fossil fuel burning have increased over time around the world. The activities mentioned increasing the emission of greenhouse gases into the atmosphere.

This causes carbon dioxide (CO₂), methane (CH₄), and nitric oxide (N₂O) gas to be released into the atmosphere. The rise in greenhouse gases traps the heat that should be radiated back into the room. At some point, greenhouse gases act like a partial blanket that keeps our earth warm (6⁰ F). If our earth did not have an atmosphere to let solar energy pass through, there could be no life because the temperature of the earth's surface would have been -180 C and our planet would be a giant ice sphere. Greenhouse gas is also important for our earth. Climate change has preoccupied the world for several years. It is a slogan

along with poverty alleviation, environmental problems and security. It is a very ancient phenomenon that was observed on the surface of the earth when humans made advances in terms of technological development. Climate change is defined as a climate change that is directly or indirectly attributed to human activities that change the composition of the global atmosphere and that, in addition to natural climate variability, are observed over comparable periods (Patz *et al.*, 2015).

According to Epstein *et al.*, 2011 claim that the air over the Antarctic Peninsula has warmed by 6°C (11F) over the past decade due to climate change. Today the greenhouse increases the surface temperature by 320°C (McMichael *et al.*, 2017).

This literature clearly shows that our earth is getting warmer and warmer as human development progresses. More cars are being made worldwide these days, which means more fossil fuel burning and carbon dioxide emissions. It is estimated that by 2016 the world will have 1.32 billion cars and buses. How are fossil fuels used and how are greenhouse gases added daily? In addition, industrial production is also growing to meet the demand for goods and services for almost 7.6 billion people on earth.

The manufacturing, automotive, and construction industries; to mention only the few that intensely emit halocarbon and black carbon that in turn change the climate of our precious earth. The United Nations Framework Call on Climate Change (UNFCCC) (UNFCCC, 2007), outline the evidence for climate change: global warming, change in precipitation trend, melting ice cap, glaciers and snow, and rise in sea temperature

¹ Department of Geography, Muslim University of Morongo, Tanzania

² Department of Biology, Muslim University of Morongo, Tanzania

* Corresponding author's e-mail: hamissalum704@gmail.com

on the earth's surface. This has caused the sun's heat to rise in the atmosphere, which under normal conditions could be reflected into space (UNFCCC, 2007). In the end, the generated heat leads to the greenhouse effect, which changes the earth's climate tremendously. A small increase in sea surface temperature causes cyclone wind and rain, for example, Cyclone Haiyan in 2013, terribly devastated the Philippines was powered by energy from equatorial water that was only warmed 1-2 degrees above normal (McMichael *et al.*, 2017).

Maslin (2014) argues that climate change encompasses sociology, economy, geopolitics, national, international, and above all healthy one. Climate change has and affects the social and environmental determinants of health (clean air, clean drinking water, adequate food and safe shelter). It has been found that due to the rise in heat due to climate change, the population exposed to it has increased worldwide. It was noted that between 2000 and 2016, the number of people exposed to heat increased by 125 million. In addition, 175 million additional people were exposed to the heat caused by climate change by 2015 alone. It is estimated that between 2020 and 2030, climate change will cause 250,000 additional deaths from malaria, malnutrition, diarrhoea and heat stress. It has been argued that excessive heat has psychological effects

on all people that aggravate existing illnesses or make treatment more complex. Climate change has direct or indirect effects on the health of people around the world. Cardiovascular and respiratory diseases in the elderly result from climate change. In terms of the current phenomena of COVID-19, climate change can have a major impact on it. This paper will discuss the role of climate change during this time of Covid-19. The focus will be on the role of climate change during COVID-19, a global pandemic. Before doing this, get an understanding of the potential health effects of climate change.

Potential Health Impacts of Climate Change

Climate change interrupts the natural flow of energy from the atmosphere via the earth's surface to the atmosphere again. Climate change also affects human health through various complexities over time. It has been found that human life depends on the natural ecological and physical system. Any change in these systems also changes the human life support system. As a rule of thumb, climate change will change the health pattern of the human population. There is a way in which climate change will hurt the health of the human population.

As Figure 1 above shows, climate change involves changing the pattern of heat waves, extreme weather

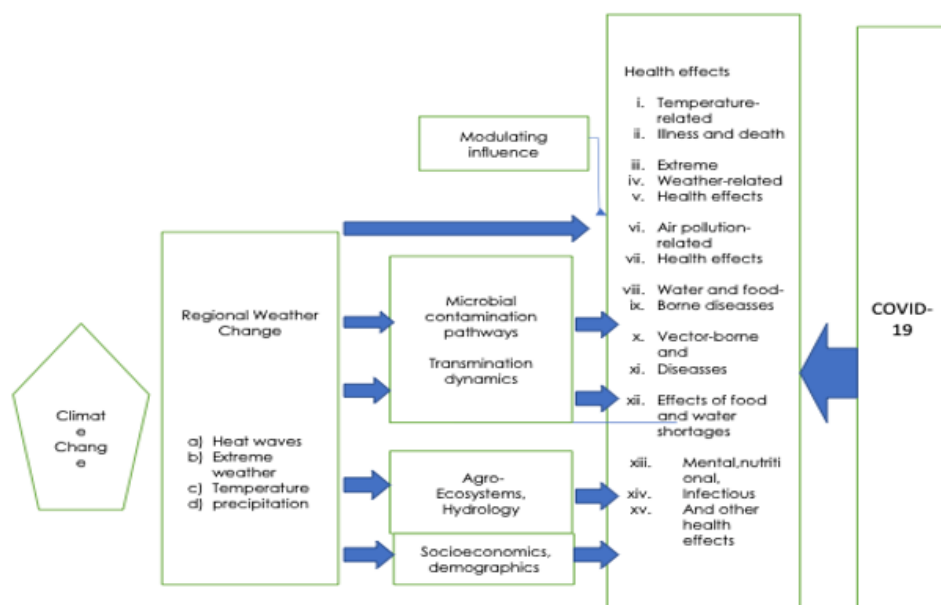


Figure 1: Potential health impacts of climate change. Sources: Adopted from Patz *et al* 2015(10)

conditions, temperatures, and rainfall. There are modelling factors as described; microbial contamination pathways, transmission dynamics, hydrology of agroecosystems as well as social economy and demography. Each factor relates to various health effects: temperature-related illnesses and deaths, extreme weather-related health effects, air pollution-related health effects, water and foodborne diseases, vector and rodent-borne diseases, the effects of food and water shortages, and psychological, nutritional, infectious and other health effects. These health effects attack the human immune system. As age and immunity decrease, the population becomes vulnerable to COVID-19. A person suffering

from any of the above diseases becomes a victim of a COVID-19 pandemic. The following section takes us through understanding what COVID-19 is. Where is it rooted and what impact it has?

COVID-19

It is a disease caused by a virus transmitted from person to person. It originated from Wuhan in China and spread to 228 countries and territories around the world and in 2 international modes of transport (<https://www.worldometers.info/coronavirus/>). The seafood market in Wuhan's Huanan; which previously sold live fish, poultry and birds is believed to be the epicentre of this

outbreak, which is why it is simply referred to as the Wuhan coronavirus. On January 8, 2020, the etiological agent of this outbreak was identified as the novel coronavirus 2019 (2019-nCoV) and its genetic sequence was quickly reported to the WHO. On January 30th, the WHO declared the outbreak a Public Health Emergency of International Concern (PHEIC).

On February 12, 2020, the International Committee on the Taxonomy of Viruses (ICTV) stated that 2019-Nov was officially designated as Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), and on the same day, the WHO declared the through. SARS-CoV-2 was officially referred to as Coronavirus Disease 2019 (COVID-19). The experts found it difficult to track down the main root of this virus as the market in the Wuhan market closed on January 1, 2020.

Some experts use their fingers to point to bats as a possible source of the virus, which is transmitted through intermediate hosts such as pangolins; that are illegally sold on Wuhan's Huanan Seafood Market to humans (Rabi *et al.*, 2020; Osler, 2019). The next section looks at the role of climate change during COVID-19. According to Osler, 2019, the Wuhan coronavirus is a highly transmitted influenza, of which scientists found it viral in connection with SARS-CoV and MERS-CoV. When the full genome of the SAR-CoV-2 was sequenced, it shared 79.5% of the genetic sequence of the SARS-CoV that caused the 20022003 pandemic (Rabi *et al.*, 2020).

Role of Climate Change During Covid-19 SAR-CoV-2 and Weather Condition

In the case of infectious diseases, it is important to take into account the influence of weather conditions such as temperature, Cold or heat, and moisture; the mass of water vapour in a unit mass of moist air. This is because weather conditions are one of the important components of disease causation (Baker *et al.*, 2018; Deventer and Hochberg, 2016). This is obvious because viruses and other infectious agents occur in our environment. In the event of COVID-19, once infectious droplets land on different surfaces, their ability to survive on those surfaces determines whether contact transmission is possible or not. Based on our current understanding of other beta coronaviruses; including SARS and MERS, coronaviruses can survive; and remain infectious for 2 hours up to 9 days on inanimate surfaces such as plastic, glass and metal, with increased survival rates in drier and colder environments (or regions). Based on this understanding, various governments have been reported to have disinfected various inanimate surfaces to contain the virus. Cleaning of surfaces with common biocides; like sodium hypochlorite and ethanol, is very effective in inactivating the coronavirus within 1 minute of exposure (Rabi *et al.*, 2020)

SAR-CoV-2 and the Climatic Condition

Climate; is the weather conditions in an area in general or over a longer period that have a general impact

on infectious diseases such as COVID-19. A large-scale study carried out through critical analysis of the data from the official sources of the Ministry of Health of all countries as well as from the World-Info-Meter of COVID-19(<https://www.worldometers.info/coronavirus/>) has shown a relationship between climate and infection rate of COVID-19 (Iqbal *et al.*, 2020). In this study, the authors collected data on COVID-19 cases from the 1st reported case (in Wuhan, China) to June 5, 2020, in various affected countries and regional climate parameters; such as meteorological data, from January 2020 to June 5, 2020. Overall, it has been found that many countries in the relatively lower temperature region have a rapid increase in COVID-19 cases than those in warmer region Climatic regions despite their better social and economic conditions. Many other studies also looked at this relationship between the COVID-19 infection rate and climate conditions. For example, studies using a regression framework have examined the role of temperature and relative and specific humidity in the spread of COVID-19, suggesting that dry and cold conditions increase the rate of infection of COVID-19 (Bukhari and Jameel, 2020; Ma *et al.*, 2020 in Beker *et al.*, 2020).

COVID-19 and Climate Change

Many kinds of literature address the relationship between climate change and COVID-19 in terms of the impact of climate change on susceptibility to COVID-19. As mentioned earlier, climate change has and affects the social and environmental determinants of health and safety, such as clean air, safe drinking water, adequate food and safe shelter. Zavaleta-Cortijo *et al.*, (2020) looked at the connection between one of these determinants and COVID-19. They say climate change is affecting the food systems of indigenous peoples, making them vulnerable to food and nutrition insecurity. Then food and nutrition insecurity undermines their immunity status, subsequently making them vulnerable to COVID-19.

Similar soil is used for other effects of climate change: sunburn due to global warming, mutation due to depletion of the ozone layer, air and water pollution due to emission of harmful gases or chemicals and other effects can affect the immune status of people due to the development of various diseases such as respiratory diseases such as Asthma or chronic obstructive pulmonary disease, cardiovascular diseases such as myocardial infarction and heart attack, chronic kidney disease of unknown origin and diseases of the genetic makeup of people such as cancer, etc. It is medically known that people with weakened immunity are at a higher risk of contracting SAR-CoV -2 and being severely affected by COVID-19 (Rabi *et al.*, 2020). There are also more speculative discussions about how the occurrence of pandemics can be linked to climate change. It is reported that from 2°C of global warming, the possibility of reaching tipping points such as the melting of the Arctic permafrost becomes relatively great and the global warm the earth

at 1.5 (IPCC,2018; This underscores the question of whether rising temperatures could revive old viruses; now frozen to which we could be as vulnerable as Covid-19 (Da Silva, 2020).

On the other hand, the COVID-19 outbreak has been reported to reduce the production of the causative agents of climate change due to the decline in lock-related production activities (Damani, 2020; Geladari *et al.*, 2020). For example, it has reduced China's CO₂ emissions by a quarter and led to improvements in air quality that could eventually save more lives than the virus killed (Geladari *et al.*, 2020). However, these climate change factors, such as greenhouse gas emissions, are expected to counter-increase as climate advocates return to facing the real problems. This offers a lesson for everyone involved.

Prevalence and Mortality of COVID-19: Reasons for the Big Differences Around the World

When we examine the COVID-19 data reported by the World-Info-Meter of COVID-19 (<https://www.worldometers.info/coronavirus/>) and from various studies such as Al-Tawfiq *et al.* (2020) analyzed, we see a very large variation in its death rates. Are there plausible descriptions of the larger variations in COVID-19 prevalence across countries? The answer is yes, there are plausible descriptions for this variant. One study suggested that this prevalence variability could be due to differences in transmission and migration rates (Nehru *et al.*, 2020). In this article, we add the variability of weather and climatic conditions as additional factors for the transmission of SAR-CoV-2 and climate change in general as an additional factor for the severity of COVID-19. In addition, Neher *et al.*, 2020 in Al-Tawfiq *et al.*, 2020 have highlighted that climatic conditions; largely associated with climate change, are one possible explanation for the increased transmission of COVID-19 and the occurrence of outbreaks in the community in countries with temperatures of 511 °C and low humidity.

DISCUSSION

As the literature shows, climate change played a significant role during COVID-19. As mentioned earlier, the COVID-19 pandemic has mainly affected dry countries and countries with lower altitudes than the wettest countries. According to Neher *et al.*, 2020 in Al-Tawfiq *et al.*, 2020, climatic conditions; which are essentially linked to climate change, are postulated as a possible explanation for the increased transmission of COVID-19 and the occurrence of outbreaks in the community in countries with a temperature of 511 °C. In another context, this pattern is similar to the seasonal flu pattern, also caused by viruses. Climate changes have had an impact on the environment and the health of people around the world. Climate change is changing the environmental security of; clean air, safe drinking water, adequate food and safe shelter. Currently, people live at high risk for cardiovascular and respiratory diseases. These conditions pose two risks for people: the risk

of becoming susceptible to SAR-CoV-2 and the risk of becoming seriously ill with COVID-19 (severity of COVID-19) after being infected with SAR-CoV-2.

In addition, the food security system is affected by climate change. Climate change changes the theoretical weather and climate pattern, as in some areas more or fewer rain falls than normal. This situation affects the community production system around the world. This leads to a food shortage; characterized by nutritional diseases and weakened immunity, a situation that makes people vulnerable to COVID-19. Because of the low production, buying good quality food will also be expensive and poor people will be more vulnerable to the COVID-19 pandemic.

Even though the experts have not yet presented clear scientific evidence showing the root source of SAR-CoV-2, this novel virus could be rooted in the climate change aspect; like global warming and the like which, according to Da Silva, 2020, are their contributions to the evolution of species; especially new strains of the virus, can never be ignored. And we should remember that one of the existing theories about the origin of SAR-CoV-2 is that it could have evolved from the previous coronavirus species due to the combination of environmental and genetic factors (Anderson *et al.*, 2020; Rabi *et al.*, 2020). The world has a complex system in which one system is related to or dependent on another system. For example, food systems have to do with climate, just as food systems have to do with health systems. Changing the pattern of a system affects all systems and creates a very complex situation that is difficult to resolve.

CONCLUSION

This paper discussed climate change, and evidence of climate change worldwide was discussed. Likewise, the root of COVID-19 when was officially recognized. Followed by a discussion on the role of weather and climate change in the COVID-19 pandemic. In addition, the discussion on the role of climate change during COVID-19 was briefly covered. Final remarks, the world must take good care of our earth by stopping or not reducing the excessive production of greenhouse gases. Otherwise, the human species will die from disease, viruses, disasters, and starvation. Proof of this is in the effects of COVID-19, which is crippling not just the individual but the economy worldwide.

REFERENCE

- Al-Tawfiq, J. A., Leonardi, R., Fasoli, G., and Rogimonti, D. (2020). Prevalence and fatality rates of COVID-19: What are the reasons for the wide variations worldwide? *Travel Medicine and Infectious Diseases*, 35, 101711.
- Anderson, K. G., Rambaut, A., Ian Lipkin, W., Holmes, E. C and Garry, R. F. (2020). *The proximal origin of SAR-CoV-2*. *Nature Medicine*. <https://doi.org/10.1038/s41591-020-0820-9>.
- Baker, R. E., Mahmud, A. S and Metcalf, C. J. E. (2018).

- Dynamic response of airborne infectious to climate change: *Prediction for varicella. Climate change*, 148, 547-560.
- Baker, R.E., Yang, W., Vecchi, G.A., Metcalf, J.E., Grenfell, B.T. (2020). Susceptibility supply limits the role of climate in the early SAR-CoV-2 pandemic. *Science*, 369, 315-319.
- Bukhari, Q and Jameel, Y. (2020). Will coronavirus pandemic diminish by summer. <https://dx.doi.org/10.2139/ssrn.3556998>.
- Coronavirus cases. (2022, October 21). <https://www.worldometers.info/coronavirus>.
- Da Silva. (2020, April 23- May 13). Green Swan 2 Climate change and Covid-19: reflections on efficiency versus resilience. *Based on remarks at the OECD Chief Economist Talk Series, Paris and a Research Webinar at the BIS*. <https://www.bis.org/speeches/sp200514.pdf>. Accessed on August 22, 2020.
- Damani, A. (2020). *COVID-19 and Climate Change. Sushruta* 13(2).
- Edmond, A. M, and Smerdon J.E. (2018). *Climate Change: The science of Global Warming and our energy future*, New York, Chichester, West Sussex.
- Epstein, P. R, M. D and Ferber D. (2011). *Changing Planet, Changing Health*, California Press Berkeley, Los Angeles, California
- Geladari, C., Andreadis, E.A., Dourakis, S.P, and Geladari E. (2020). *Is the COVID-19 pandemic linked to climate change?* [Pre-print]. <https://www.researchgate.net/publication/340581324>.
- Iqbal, M. M., Abdi, I., Hussain, S., Shahzad, N., Waqas, M. S., and Iqbal, M. J. (2020). The effects of regional climatic conditions on the spread of COVID-19 at a global scale. *Science Total Environment*, 739.
- Ma, Y., Zhao, Y., Liu, J., He, X., Wang, B., Fu, S., Yan, J., Niu, J., Luo, B. (2000). Effect of temperature variation and humidity on the mortality of COVID-19 in Wuhan [Preprint]. <https://doi.org/10.1101/2020.03.15.20036426>.
- Maslin, M. (2014). *Climate change: A very short introduction*, Oxford University Press.
- McMichael, A. J., Woodward A and Muir C. (2017). *Climate Change and the Health of Nation, Famine, Fever and the Fate of population*, Oxford, University Press.
- Neher, R.A., Dyrdek, R., Druelle, V., Hodcroft, E.B., Albert, J. (2020). The potential impact of seasonal forcing on a SARS-CoV-2 pandemic. *Swiss Medical Weekly*, 150.
- Osler, S. (2019). Coronavirus Outbreak, *All the secrets revealed about the COVID-19 pandemic*.
- Patz, J, A. Levy B. S. (2015). *Climate Change and Public health*, Oxford University Press.
- Rabi, F.A., Al-Zoubi, M.S., Kasasbeh, G.A., Salamah, D.M and Al-Nasser, A.D. (2020). SAR-CoV-2 and Coronavirus Disease 2019: What we know so far. *Pathogens*, 9, 231.
- Romm, J. (2016). *Climate Change; What everyone needs to know*, Oxford University Press, 198 Madison, Avenue New York, NY 10016
- United Nations Framework Convocation on Climate change (UNFCCC, 2007). *Climate Change, Impacts, Vulnerabilities and Adaptation in Developing Countries*.
- Van Seventer, J. M and Hochberg, N. S. (2016). Principles of Infectious Disease: Transmission, Diagnosis, Prevention and Control. *International Encyclopaedia of Public Health*, 22-27.
- Zavaleta-Cortijo, C., Ford, J.D., Arotoma-Rojas, I., Lwasa, S., Lancha-Rucoba, S., Garsia, P.J *et al.* (2020). *Climate change and COVID-19: Reinforcing indigenous food systems. The lancet planetary health*. [https://doi.org/10.1016/s2542-5196\(20\)30173-x](https://doi.org/10.1016/s2542-5196(20)30173-x).