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Impact of climate change on tropical health in the Central African Republic

Aborode Tunde Abdullahi¹, Corriero Anna Chiara², Mehmood Qasim³, Chahal Priyanka⁴, Mohammad Mehedi Hasan⁵, Upadhyay Prashant⁶, Nolkha Yash Kumar⁷, Sahi Usman Javed³, Ahmed Fatima Abdirazak⁸✉

¹Healthy Africans Platform, Research and Development, Ibadan, Nigeria

²School of Medicine, Anglia Ruskin University, England, United Kingdom

³King Edward Medical University, Lahore, Pakistan

⁴S. Tentishev Asian Medical Institute, Kant, Kyrgyzstan

⁵Department of Biochemistry and Molecular Biology, Faculty of Life Science, Mawlana Bhashani Science and Technology University, 1902 Tangail, Bangladesh

⁶Government Medical College Jalaun, Uttar Pradesh, India

⁷Lokmanya Tilak Municipal Medical College, Mumbai, Maharashtra, India

⁸Kampala University, Galdogob, Puntland, Somalia

Climate change is the variation in climate that human activities contribute to, directly or indirectly. Furthermore, climate change impacts human activity, but it also affects human existence and sustenance[1]. Climate change has shown a negative impact on the quality of life, morbidity, and mortality of people across the globe[1,2]. In Central African Republic (CAR), the number of reported weather-related natural disasters has more than tripled since the 1960s[2]. Since then, these disasters have resulted in over 600 000 deaths[2].

Climate change increasingly affects the health of the people in the CAR due to many factors, including higher temperatures, droughts, changing rainfall patterns, and increased climate variability. The health of people in the CAR is vulnerable to low levels of adaptive capacity, poor diffusion of technologies as well as socioeconomic conditions[2].

The effects of climate change have been observed among people affected with psychological issues, causing excessive anxiety, also called eco-anxiety, and worsening pre-existing gender disparities and poverty, particularly in agricultural and rural communities[3]. This paper discusses the effects of climate change on tropical health and its environment in CAR and provides recommendations that can promote sustainable healthcare practices moving forward as shown in Figure 1.

1. Climate change in the CAR

The CAR has the least efficient public health system in the world. Tropical diseases such as malaria, schistosomiasis, dengue fever,

and meningitis are observed with high frequency in this region[4]. In particular, most of the yearly global malaria cases reported are from Africa, malaria is predicted to increase as a result of vector change in CAR[4]. Climate changes affect the spread of neglected tropical diseases (NTDs) and alter people's disposition to these infections[4].

Due to the growing population in CAR, the demand for agricultural land is increasing. Therefore, this has led to the conversion of the forests to non-forest lands for agricultural and other purposes. Poor forest management, excessive harvesting of firewood, and unrestricted logging may lead to the destruction of forests; this will come along with natural disasters such as forest fires and floods. Trees absorb carbon from the atmosphere and reduce the carbon burden of the air. Therefore, due to deforestation, the levels of carbon dioxide increase, which leads to the greenhouse effect and global warming[5].

In addition to the climate crisis in the CAR, two other significant challenges for the local population are finance and funding. A report called Africa Adaptation Gap recognized that the execution

✉To whom correspondence may be addressed. E-mail: fatimabdirazak112@gmail.com

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of climate action could only reach its full potential by full-scale efficacious national and regional capacity building, policy planning, and governance. Implementation of new climate strategies entirely depends on the available funds, which are currently insufficient in the CAR[6].

3. Causes of climate change in the CAR

The economy of the CAR is based mainly on agriculture and forestry. According to a recent report, 70% of the people living in CAR are involved in agricultural practices[7]. The CAR's contribution to global atmospheric CO₂ release is low; however, its flora-fauna and ecosphere are severely affected, and most are endangered by the change in climate across the entire globe[7].

The contribution of CAR to greenhouse gas production and air pollution is through local activities. For example, traditional stoves are used by people in different parts of CAR mainly for cooking; this is possibly due to low incomes, traditional practices, and unsatisfactory living standards. The smoke coming out of these stoves contributes significantly to the local CO₂ production and air pollution. Furthermore, the smoke that comes from the burning of farm trees, woods, and grass when clearing off the land for agricultural practices also contribute to air pollution.

The effects of climate change on the CAR ecosystems and populations are exaggerated due to substandard governance and prevalence of poverty; furthermore, poor community unawareness about climate change and some false beliefs that these climatic changes are related to spiritual forces also play a role in the substandard climate action[7].

4. Effects of climate change on tropical health in the CAR

Climate change in CAR poses many challenges to the local population. These include high temperatures, shortage of pure drinking water, food scarcity due to drought, and flooding. All these adverse events deleteriously affect the quality health of the local population[8].

For example, on the 7th of August 2021, heavy rain hit Bangui and its surroundings in CAR. Ten districts of Bimbo were affected tremendously, as well as cities of Birao and Baoro, affecting a total of about 799 households (3952 people)[9]. Having faced these situations, these people will now be more vulnerable to viral diseases including COVID-19, malnutrition, NTDs, food insecurity, and mental health diseases.

Therefore, in addition to poverty and food insecurity, climate change makes the local population experience the most significant proportion of the NTDs burden[9]. Like everywhere else in the world, climate change in CAR causes intense heat waves and higher daily temperatures resulting in increased risks of morbidity and mortality

as a result of tropical diseases. People living in urban settings are more vulnerable to heat-related climate changes due to the polluted atmosphere in cities and the increased density of the population[8,9].

Lack of public awareness on responding to increased environmental heat increases the risk of dehydration. Climate change in the CAR also leads to a shortage of pure drinking water, which forces the population to lean towards utilizing contaminated water sources, resulting in increased risks of developing waterborne infectious diseases.

Some of the primary reasons for water shortage in CAR include poor waste disposal system, water pollution, misuse, and overuse; furthermore, the growing water demands for cooking and other activities of daily living also contribute to this crisis. Research has proven that water scarcity can lead to hunger and poverty due to a direct impact on agriculture and livestock[10]. If water is not available for cleaning and washing purposes, poor hygienic conditions will ensue, leading to an increased incidence of infectious diseases like cholera, plague, typhus, and diarrhea.

Furthermore, the stability of the ecosystems and the presence of biodiversity are also threatened by water shortages[10]. The risk of vector-borne infectious diseases like malaria will increase if climate change continues in the CAR[9]. Mosquito vectors get favorable conditions for rapid multiplication and transmission of infections, especially in people with poor access to food and medical care. This situation is also very problematic for the CAR healthcare agencies[10].

On the other hand, the CAR houses some endemic and highly lethal diseases such as the Zika virus and Ebola virus. As a whole, infectious diseases cause about one-quarter of deaths worldwide, causing about 10 million deaths per year. Many of them are in the CAR, worsening under worse climate conditions. The changes in seasons, rainfall patterns, and seasonal characteristics have also been noticed due to temperature and climate change in CAR. Some seasons have been either shortened or prolonged in CAR. Winters have extended in many places, while summer is more severe in other areas. The degree of dependability on weather forecasts has been reduced.

The increased price of goods and the decreased availability of substantial nourishment will increase malnutrition in children. Weak institutions and limited access to technology are significant hurdles to overcome if the CAR wants to prevent these catastrophes. The CAR government has created a partnership with the United Nations on Environmental Programs to implement sustainable climatic actions in CAR and other Africa countries[10]. Hopefully, future political and governmental strategies will address the issues discussed in this paper thus far.

5. Recommendations

The recommendations that can mitigate climate change on tropical health in the CAR indicate that there is a need for an effective and

efficient tropical health response in the CAR to enhance public health preparedness and to reduce the risks of climate change by proper management in the CAR. There is a need for general community sensitization, education, and health promotion in the CAR. The local population needs to be up-to-date and aware of current news and climate change in their country. In 2016, for example, United Nations Educational, Scientific and Cultural Organization launched a program called "Today for Tomorrow: Coordinating and Implementing the Global Action Programme on Education for Sustainable Development", which took place in more than 250 schools in 25 countries over five regions in CAR[9]. Similar programs should become even more popular if the country wishes to educate its population on these crucial issues.

There is a need for collaboration at the local and regional levels. Collaborating with local, regional, and neighboring countries to learn how to implement successful projects will be helpful in the country as a whole. The national governments must encourage the establishment of think tanks in CAR that can ponder over the climate crisis and its causes; the government should take these opinions on policy-making into strong consideration, especially regarding the management of public health crises. Different private and non-profit organizations in CAR have put in successful efforts to reduce climate change and its effects through creative and sustainable ideas and actions. Therefore, they should be equally supported and considered as well.

There should be the creation of a food security organization in CAR that can supply nutrition and clean water to climate-induced famine-

hit areas. This will overall reduce the burden of malnutrition on the healthcare system, which is already collapsing due to infectious disease and lack of funds. There is a need to work on an integrated scientific approach that focuses on the improvement of climate conditions through innovative thinking approaches. For example, there should be a shift towards clean energy natural sources such as solar and wind energy. This should come hand-in-hand with reducing carbon emissions and waste, along with the encouragement of tree planting. Implementing a project similar to the United Nation-led projects in Côte d'Ivoire and Senegal would be incredibly helpful for the CAR in this sense.

There must be a restriction on human settlements' expansion into forests and natural habitats in CAR; this is due to the damage that causes on the ecosystems and the environment as a whole, as well as the severe health risks that come from settlements into forestland. For example, Ebola allegedly originated due to human-animal proximity. It is, therefore, crucial to avoid recreating similar fertile conditions for the future development of similar epidemics.

The local organizations and the people can lessen the burden of climate change on the region by amplifying climate action, by avoiding rudimentary stoves and avoiding contributing to deforestation; the planting of more trees, and usage of water catchment systems will also be helpful. However, the local population will need to be educated and supported to make a change.

A summary of the impact of climate change on public health in CAR, causes, effects, and recommendations is provided in Figure 1 below:

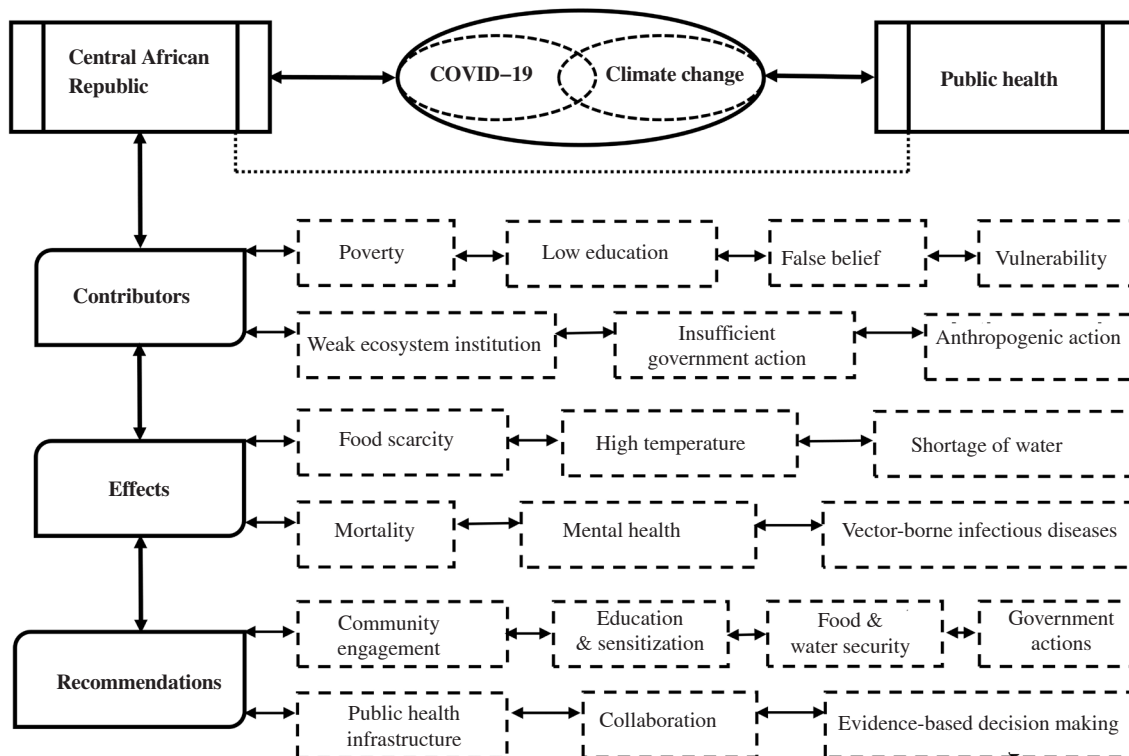


Figure 1. An overview of the impact of climate change on public and tropical health in Central African Republic amidst COVID-19 pandemic.

Conflict of interest statement

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Authors' contributions

ATA, AOO, TAH, AOA supervised and were involved in study conception and design, data collection, analysis and interpretation, writing manuscript, and critical revision. ATA, AOO and AOA contributed to reviewing the manuscript, verified the critical revision for intellectual content. All authors finally approved the version to be published.

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