



Facing Diseases Related to Climate Change: Preparing the Medical Community for the New Challenges

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Letter to the Editor

Climate change has had devastating impacts on global health, manifest in a variety of diseases and adverse conditions [1,2]. From leptospirosis [3] to Covid-19 [4], from dengue fever to heat waves [5], the current scenario calls for an urgent reassessment of public health strategies and medical training. This letter aims to address the challenges posed by climate change to public health and to propose measures to face them, emphasizing the need for robust preparation of the medical community, in both initial and continuing education.

Climate change has aggravated the incidence of diseases transmitted by vectors, food, and water [6,7]. Dengue fever, for example, is spreading to previously unaffected regions due to rising temperatures and changes in rainfall patterns that favor the proliferation of the *Aedes aegypti* mosquito [8]. In addition to dengue, yellow fever [9], Chikungunya [10] and malaria [11]

are spreading to areas previously free of these diseases, representing a major public health challenge. Leptospirosis, transmitted through contact with contaminated water, has become more prevalent in areas subject to flooding [12]. Covid-19 has also highlighted how climate change can influence the spread of infectious diseases, exacerbating environmental conditions that facilitate viral transmission [13,14].

The heatwave that hit Europe in 2022, resulting in 61,000 deaths, illustrates the deadly impact of extreme temperatures [15]. In Greece, countless people have perished in the mountains due to exhaustion and the heat [16]. These extreme events are not isolated tragedies, but alarming signs of public health conditions that we must be prepared to face on a regular basis.

Climate change also threatens food security, as changes in weather and climate affect agricultural production, resulting in food insecurity and malnutrition [17,18]. Furthermore,



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food- and water-borne diseases are becoming more common, as higher temperatures and variable water conditions create favorable environments for pathogens [19,20]. Rising ocean levels will lead to flooding and water contamination, causing outbreaks of diarrhea and water- and food-borne infections [21]. Rising seas, combined with increased air pollution, will facilitate the spread of viruses and other pathogens, worsening cases of Covid-19, flu, and bronchiolitis [22-24]. The increase in atmospheric heat can and will worsen, which will contribute to an increase in asthma and other respiratory diseases [25].

Another critical aspect worth highlighting is the increase in heart disease. Heatwaves increase the risk of cardiovascular diseases, including heart attacks and strokes [26,27]. Extreme heat can lead to dehydration, increased blood viscosity, and heat stress, overloading the cardiovascular system [28]. People with pre-existing heart disease are particularly vulnerable, and mortality from heart problems tends to increase during periods of extreme heat [29,30]. Higher temperatures, heat waves, and sudden changes in temperature are also likely to increase the number of miscarriages and pregnancy complications [31]. It is alarming that, instead of recognizing the proven effects of rising temperatures on the cardiovascular system, some denialist narratives on the internet wrongly attribute the increase in heart attacks to vaccines [32], ignoring the scientific evidence on climate change [33].

The rise in greenhouse gas emissions contributes significantly to environmental degradation, which can promote the spread of diseases between species [34,35]. Examples of this are Covid-19 [36] and Ebola [37], which possibly originated from more frequent interactions between humans and wild species due to the destruction of natural habitats. Environmental catastrophes, such as floods and droughts, also lead to the displacement of populations, which increases a variety of diseases and further aggravates the mental health of affected communities [38].

Climate change also has profound impacts on people's mental health, causing or exacerbating conditions such as anxiety, depression, and post-traumatic stress disorder [39,40]. Rising temperatures, the frequency and intensity of natural disasters, and food insecurity all contribute to an environment of uncertainty and emotional instability [41]. These effects are observed in all age groups, affecting children, adults and the elderly alike, and all regions of the world. The mental health of vulnerable communities is particularly affected, exacerbating social and health inequalities [42].

It is also important to stress that many of these diseases are more pronounced in poor and developing countries, where health infrastructures are often inadequate and resources are limited [43,44]. This context makes it even more difficult to cope with the increase in these diseases, requiring the medical community not only to have differentiated training, but also to be supportive and empathetic [45]. Doctors and health professionals from these countries, as well as from more developed nations, need to work together collaboratively and altruistically to mitigate the impacts of climate change on global health [46,47].

Another significant challenge for doctors is dealing with the scientific denial that rages on the internet and social networks [48,49]. Sometimes denying climate change and global warming, sometimes denying its seriousness, this movement [50] spreads misinformation that can seriously compromise public health efforts [51]. It is worrying that such denial has even

reached some members of the medical community [52], which presumably results in a greater spread of misinformation, given the trust that the population has in health professionals. It is crucial that health professionals are prepared to combat misinformation and educate the public about the real causes of health problems, including the proven effects of climate change.

Considering the magnitude of these challenges, the medical community must adopt a proactive approach in its initial and continuing training, and this training must consider, analyze, and respond to ongoing and worsening climate change [53]. Medical schools and medical education programs should integrate courses and modules on the impacts of climate change on health, preparing future doctors to recognize and treat climate-related diseases [54,55]. It is essential to include topics such as the epidemiology of emerging diseases, natural disaster management, environmental health, and the specific implications of climate change for cardiovascular and mental health in medical curricula [47,56].

For practicing professionals, continuing education should offer training on the best practices for dealing with climate change-related diseases and conditions. Workshops, seminars, and refresher courses are essential to keep them informed about the latest scientific advances and mitigation strategies. In addition, interdisciplinary collaboration among doctors, environmental scientists, and public health experts should be encouraged in order to develop integrated and effective approaches.

The adaptation of health infrastructures is also crucial. Hospitals and clinics must be equipped to deal with an expected increase in patients during extreme weather events, and public health policies must be adjusted to respond quickly to outbreaks of climate-related diseases. The development of early warning systems and the implementation of epidemiological surveillance programs can help detect and contain outbreaks more effectively.

Finally, tackling climate change-related diseases requires a significant transformation in medical education and practice. The medical community must be well prepared for these new challenges, adopting a holistic approach that combines prevention, mitigation and rapid response. Only through adequate preparation and coordinated action will we be able to protect the health of populations in a world increasingly affected by climate change.

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