

Climate Change's Impact on Brain Health: Opinion

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INTRODUCTION

Climate change will inevitably have severe implications on all parts of our life, including changes in climate that affect flooding and drought, as well as changes in air, water, and soil quality and pollution, changes in ecology, and changes in food production. These factors will have a negative impact on our health, particularly our mental health [1].

Heat and the Brain: Dementia, Stroke, Migraine & Seizures

In extreme circumstances, heat exposure can cause hyperthermia and heat stroke, both of which can be fatal. Hyperthermia and heat stroke will inevitably become more common as global temperatures continue to climb. Hyperthermia, as well as climate-change-related air shifts, has been linked to an increase in migraines, seizures, strokes, and several kinds of dementia, including Alzheimer's disease. A brief overview of some of the potential mechanisms that may raise the incidence of such illnesses as a result of increased temperature will be covered below. A range of abnormal cellular processes occurring within the brain may be attributed to proposed pathways underpinning heat and brain disease [2].

Increased temperature can also cause seizures, which can progress to hyperthermia and heatstroke. Heat-induced stimulation of TRPV4 channels and NMDAR signalling may play a role in seizure genesis. By interfering with GABA signalling, hyperthermia can trigger epileptiform discharges in cortical neurons [3].

Heat exposure, particularly heat stroke/hyperthermia, can cause significant metabolic, cellular, inflammatory, and microvascular alterations in the brain, which can result in a variety of potentially fatal neurological repercussions ranging from seizures to dementia (neurodegeneration). Many of these theoretical and scientifically proven observations are extremely complicated, and proving direct cause and effect is challenging, yet many preclinical studies suggest that hyperthermia can have a major effect on neurological health.

Clinically, they may be linked to other factors such as changes in our behaviour, changes in our diet/water intake, and other lifestyle changes that may have a negative impact on our brain health.

Infectious Diseases

Increased prevalence of infectious diseases such as vector-borne and zoonotic diseases will be a direct result of all the changes connected

with climate change (VBZDs). Malaria, Dengue fever, and Japanese encephalitis, for example, are often locally restricted to specific geographic places around the equator. As the temperature of many more regions further from the equator becomes more tropical, the distribution of such illnesses changes, with previously non-endemic regions such as Southern Europe becoming more endemic [4].

Many viruses, including Dengue, Zika, Chikungunya, West Nile, and Yellow Fever, are transmitted by the *Aedes* spp. mosquito, which is found in tropical areas. Some of these conditions have direct neurological implications. Dengue infection, for example, can result in neurological complications in roughly 20% of patients, including encephalitis and encephalopathy. Furthermore, Dengue fever is now the world's fastest-growing tropical sickness, and its incidence is expected to rise as a result of climate change. Yellow fever can also cause potentially catastrophic neurological problems including encephalitis, which is characterised by acute neuroinflammation and extensive neuronal destruction.

West Nile virus is a neurotropic virus that can cause severe encephalitis in humans and horses. It is especially dangerous to babies, the elderly, and individuals with compromised immune systems. Malformed brain development in growing babies can be caused by Zika infection in the mother during pregnancy. Microcephaly, cortical thinness, and blindness are examples. It can cause meningoencephalitis in adults, which can develop to Guillain-Barre syndrome [5].

To summarise, climate change is having a significant impact on everything from the ecosystem to food, air, and water quality, as well as our health. Increased brain temperature can have long-term pathological implications, such as raising the risk of dementia, stroke, epilepsy, and migraines. Furthermore, specific diseases such as malaria, dengue fever, and yellow fever are all on the rise as a result of the changing environment, and many of these have direct neurological implications.

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Received: August 05, 2021; Accepted: August 18, 2021; Published: August 25, 2021

Citation: Wu H (2021) Climate Change's Impact on Brain Health: Opinion. *J Pollut Eff Cont* 9:303. doi: 10.35248/2375-4397.21.9.303.

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