

Global climate change impacting natural water and infectious diseases: cholera as a case study

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We depend on water for drinking, bathing, growing crops, supporting livestock and aquaculture, shipping goods, generating electricity, and recreation. Climate change has a profound impact on water availability and quality and is a major concern. Because of the rise in global temperature, rapid melting of polar ice triggers sea-level rise, causing saltwater intrusion into groundwater drinking supplies, especially in coastal areas around the world. Also, with population growth, the need for drinking water expands and, at the same time, pollution of water sources increases because of inadequate wastewater management, among other reasons. As a result, access to safe water supplies is shrinking and also affecting disease causing agents impacting human health.

Because of rising temperature and its effect on rainfall patterns, climate change is expected to have a consequential effect on the burden of infectious diseases transmitted by insect vectors and/or through contaminated water. Several bacterial and parasitic diseases have been identified over the past two decades directly or indirectly effected by global climate change e.g., malaria, hanta virus, and cholera. Malaria epidemics tend to occur during rainy seasons in tropical areas, whereas epidemics of mosquito-borne West Nile virus occur during periods of drought because mosquitoes and birds are the primary hosts of the virus and they are in close contact with humans via water shared under conditions of limited water supplies enhancing the transmission of the virus. During droughts, natural predators of mosquitoes are significantly reduced in number causing escalation of mosquito populations, increasing chance of transmission of disease. Cholera has been directly associated with temperature, although other indirect effects are also under study. Phytoplankton support zooplankton populations. Larger populations of chitin containing zooplankton provide larger surface area for cholera bacteria to attach and multiply, thereby providing an infectious dose for humans. Natural water for recreation or potable water treated inadequately can be a significant source of cholera and other enteric diseases. In conclusion, safe drinking and recreational water is a necessity for sustainable cities and is potentially more challenging due to climate change and urbanization from population growth, issues of current concern.