Global climate change and its potential impact on disease transmission by salinity-tolerant mosquito vectors in coastal zones

Ramasamy, R.[a] and Surendran, S.N.[b]

[a] Institute of Health Sciences, Universiti Brunei Darussalam, Gadong, Brunei Darussalam
[b] Department of Zoology, University of Jaffna, Jaffna, Sri Lanka

Abstract

Global climate change can potentially increase the transmission of mosquito vector-borne diseases such as malaria, lymphatic filariasis, and dengue in many parts of the world. These predictions are based on the effects of changing temperature, rainfall, and humidity on mosquito breeding and survival, the more rapid development of ingested pathogens in mosquitoes and the more frequent blood feeds at moderately higher ambient temperatures. An expansion of saline and brackish water bodies (water with <0.5 ppt or parts per thousand, 0.5-30 ppt and >30 ppt salt are termed fresh, brackish, and saline respectively) will also take place as a result of global warming causing a rise in sea levels in coastal zones. Its possible impact on the transmission of mosquito-borne diseases has, however, not been adequately appreciated. The relevant impacts of global climate change on the transmission of mosquito-borne diseases in coastal zones are discussed with reference to the Ross-McDonald equation and modeling studies. Evidence ispresented toshow that an expansion of brackish water bodies in coastal zones can increase the densities of salinity-tolerant mosquitoes like Anopheles sundaicus and Culex sitiens, and lead to the adaptation of fresh water mosquito vectors like Anopheles culicifacies, Anopheles stephensi, Aedes aegypti, and Aedes albopictus to salinity. Rising sea levels may therefore act synergisti-cally with global climate change to increase the transmission of mosquito-borne diseases in coastal zones. Greater attention therefore needs to be devoted to monitoring disease incidence and preimaginal development of vector mosquitoes in artificial and natural coastal brackish/saline habitats. It is important that national and international health agencies are aware of the increased risk of mosquito-borne diseases in coastal zones and develop preventive and mitigating strategies. Application of appropriate counter measures can greatly reduce the potential for increased coastal transmission of mosquito-borne diseases consequent to climate change and a rise in sea levels. It is proposed that the Jaffna peninsula in Sri Lanka may be a useful case study for the impact of rising sea levels on mosquito vectors in tropical coasts.

Author keywords

Aedes; Anopheles; Brackish water habitats; Climate change; Coastal zones; Mosquito-borne diseases; Preimaginal development; Sea level rise