Malaria in the Era of Climate Change in Africa: A Rapid Evidence Synthesis

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Background

Malaria is a parasitic disease caused by five forms of the Plasmodium parasite. The complex transmission dynamics of malaria are strongly influenced by environmental conditions, temperature, rainfall, humidity, wind speed and altitude, among others. Climate change has multifaceted effects on malaria transmission in the African highlands where temperature and rainfall limit the abundance of mosquitoes.

Objective: To summarize the best available evidence on the influence of climate change on malaria incidence in Africa.

Methods: A rapid evidence synthesis adapted from the Supporting the Use of Research Evidence (SURE) was applied. To answer the question under review we searched for relevant studies from PubMed, the Cochrane Library, Health system evidence, Epistemonikos, and SUPPORT summary. The following key terms were used: ("Global Warming" "Climate Change" Malaria and Africa to search for relevant articles. After screening for the titles and abstracts, data from articles that were included for final review were extracted. The final result was presented in narration.

Results: It was estimated that unmitigated climate change will increase all-age malaria mortality by 2.6%. The occurrence of transmission peaks is projected in the temperature range of 26–28 °c. Malaria exhibits the strongest correlation with precipitation which create a favourable breeding ground for mosquitoes. Based on the “business-as-usual condition" the Western and some region of Central part of Africa might, with time, loose their habitat suitability for *A. arabiensis* and *A. gambiae*. In contrast, the Southern and Eastern part of the continent might become more favourable for the development of these malaria vectors. For both representative concentration pathway (RCP), RCP 4.5 and RCP 8.5, substantial increases in populations at risk from malaria are projected in East Africa and to a lesser degree Central Africa. Particular increase is projected at high elevation regions where colder temperatures have previously limited malaria transmission. In West Africa, malaria risk also increases, but is dependent on the amount of warming; in RCP 8.5, population exposed to stable transmission risk peaks mid-century and then declines, as much of the region becomes too warm. Urbanization act synergistically with warming climate as ‘heat islands’ and creating vector breeding habitat. In the absence of improved mitigating measures, dams in SSA are expected to add 1.2–1.6 million malaria cases annually in the 2020s and 2.4–3.0 million cases annually in the 2080s. if rainfall increases with increase in temperature, the increased availability of breeding sites will tend to raise vector capacity. There is a strong positive relationship between rainfall and malaria but the relationship between malaria and temperature is positively weak. At higher temperature survival rate of malaria decreases. So, under the hottest and driest scenarios near elimination of mosquito populations is predicted.

Conclusions

Under uncontrolled situation trend of malaria was estimated to increase in different part of Africa especially SSA. Some malaria vector was also expected to shift from the current location to other locations based on suitability of temperature. Some productive activities like dam construction are contributing to the African malaria increase if not mitigated.

Recommendations: The current malaria prevention method should be continued. Initiatives to mitigate the global warming should be intensified. Construction of dams should consider malaria issues. The Eastern part of Africa should initiate additional prevention mechanism to mitigate the expansion of other type of anopheles mosquitoes to the region.

Key Words:

Africa, Climate Change, Disease, Evidence synthesis, Global Warming, Malaria