

Modelling the effect of temperature change on the extrinsic incubation period and reproductive number of *Plasmodium falciparum* in Malaysia

Abstract

According to the report of the Intergovernmental Panel on Climate Change (IPCC), Malaysia will experience an increase of 3-5°C in the future. As the development of the malaria parasite, *Plasmodium falciparum*, is sensitive to temperature, we investigated, using computer models, the effect of increase of 3-5°C on the possible changes in the epidemiology of malaria transmission of *P. falciparum* in Malaysia. Four environmentally different locations were selected: Kuala Lumpur (KL), Cameron Highlands (CH), Kota Kinabalu (KK) and Kinabalu Park (KP). The extrinsic incubation period (EIP) was estimated using hourly temperatures and the mean daily temperatures. The EIP values estimated using the mean daily temperature were lower than those computed from hourly temperatures in warmer areas (KL, KK), but higher in the cooler areas (CH, KP). The computer simulations also indicated that the EIP will be decreased if the temperature was raised by 3° or 5°C, with the effect more pronounced for the greater temperature increase, and for the cooler places. The vector cohort that is still alive at a time to transmit malaria (s EIP) also increased when the temperature was raised, with the increase more pronounced in the cooler areas. This study indicates an increase in temperature will have more significant effect in shortening the EIP in a cooler place (eg CH, KP), resulting in a greater s EIP, and consequently increasing the transmission intensity and malaria risk. A temperature increase arising from the global climate change will likely affect the epidemiology of malaria in Malaysia, especially in the cooler areas.