Impact of temperature on dengue epidemics in Kandy district of Sri Lanka

Tropical Climate Guarantee

Dengue shows rapid increase with intermittent epidemics at 2-3 irregular year intervals. Epidemics are understood to be periods of unusual rapid rise in transmission. Transmission intensity depends on rainfall, temperature and relative humidity as these impact the biology, ecology and bionomics of the vector mosquito, replication of the virus. It is already established that rainfall is a driver of transmission – for example, the two seasonal peaks in cases is driven by the seasonal rainfall peaks as it leads to an abundance of surface water needed for mosquito breeding. This impact can be confounded by factors such as new serotypes and mosquito sub-species. Here, we have reviewed the impact of temperature on dengue epidemics in Kandy district.

Data on dengue cases were collected from the Regional Directors of Health Services and Medical Officer of Health from 1997- 2017 with the support of the Central Provincial Directorate of Health Services. Climatic data were collected from ground stations and satellite observations.

Dengue cases show an increasing trend from1997-2017. The monthly average of dengue cases shows a bimodal distribution with a primary season from May to August and a subsidiary season November to February. The years 2002, 2004, 2006, 2009, 2012, 2014, 2016 and 2017 were classified as epidemics years. The epidemics in 2002, 2004, 2009, and 2017 were during May to August. The epidemics starting in 2006, 2011, 2016 and 2017 were from November to February.

We found that the clear-cut epidemics were restricted to periods during which the monthly minimum temperature ranged from 21.3 – 22.2°C and maximum temperatures ranged from 28.6 – 29.6 °C. This maximum temperature range was only prevalent in 1/3 of the months in question. Statistical tests show the chance of these associations occurring is extremely unlikely. Temperature sensitivity provides an explanation as to why the dengue peaks are in mid-year unlike the end-year malaria peaks.

Further work shall be undertaken at finer spatial and temporal scales and account taken of changing serotypes, human immunity and control efficacy.