

South Atlantic ocean temperatures can predict India malaria epidemics

Colder-than-normal July surface temperatures linked to both increased monsoon rainfall, malaria epidemics



Malaria is caused by the plasmodium parasite that infects the liver and harms the red blood cells and is transmitted via the bite of infected, anopheles mosquito (pictured here).

Photo: Eurek Alert/Bloomberg

New Delhi: Sea surface temperatures in the tropical South Atlantic ocean can be used to accurately forecast, by up to four months, malaria epidemics in north and northwest India, a study published in the peer-reviewed *Nature Climate Change* on Monday claimed.

Colder-than-normal July sea surface temperatures in the tropical South Atlantic are linked to both increased monsoon rainfall and malaria epidemics in the arid and semi-arid regions of northwest India, including the vast Thar desert, according to a team of scientists at the University of Michigan. These findings, they said, could be used to prepare an early-warning system for malaria in these regions.

In an analysis of malaria epidemics in the region between 1985 and 2006, the researchers found that July sea surface temperatures correctly anticipated nine out of 11 epidemic years and 12 out of 15 non-epidemic years.

Malaria is caused by the plasmodium parasite that infects the liver and harms the red blood cells and is transmitted via the bite of infected, anopheles mosquitoes and is estimated to kill at least

40,000 people every year in India. The Indian government maintains that malaria kills only 1,000 people a year.

Previous efforts to forecast malaria outbreaks in northwest India have focused largely on total monsoon-season rainfall as a predictor of the availability of breeding sites for the anopheles mosquitoes that transmit the disease. That approach provides about a month of lead time before outbreaks occur, according to the authors.

R. Dhiman, co-author and senior scientist at the National Institute of Malaria Research in New Delhi, said that rainfall alone wasn't a strong enough indicator for an outbreak. "The July temperatures possibly portend high rainfall, as well as vegetation levels in the region and together these may explain why outbreaks are caused during particular periods." He added that the future course of study would look at Karnataka and other districts with episodic malaria outbreaks.

Lead author **Mercedes Pascual** of the University of Michigan, whose previous work includes developing a model to predict cholera outbreaks, said that the study had immense practical benefits. "The climate link we have uncovered can be used as an indicator of malaria risk," she said in a press statement. "On the practical side, we hope these findings can be used as part of an early warning system."

While the greatest number of malarial cases are found in coastal states such as Orissa where malaria is endemic, the implications of the present study are restricted to places where malaria strikes seasonally, Dhiman said.

Malaria in its epidemic form occurs primarily on the margins of the geographical distribution of the disease, in places such as arid northwest India where environmental conditions are only episodically suitable for sustaining anopheles mosquitoes.

Pascual and her colleagues analyzed epidemiological records of malaria incidence in northwest India and used statistical and computer climate models to test potential links between sea surface temperatures, monsoon rain in northwest India, and malaria epidemics there.

They found that most malaria epidemics in northwest India, which peak in October or November, occur when rainfall in the preceding summer monsoon season equals or exceeds a rainfall threshold of 0.5 mm per day, presumably required to support the growth of malaria-causing anopheles mosquitoes.

Independent experts, however, said that the findings weren't convincing. "It's an interesting model but the South Atlantic temperatures are historically a very poor predictor of monsoon rainfall," said **M. Rajeevan**, a former monsoon forecaster with the India Meteorological Department. "Their study has worked for only a 20 year period. I am not sure this will hold for the future."