Scientists link climate change to dengue outbreaks

PRESS TRUST OF INDIA

New Delhi, Jan 21: Dengue infections and deaths increase when temperatures go above 27 degrees Celsius and rainfall is moderate and spread out over a period, according to a new study.

The study also reveals very heavy rainfall (more than 150 mm in a week) can wash away mosquito eggs and larvae, lowering the risk of dengue. Researchers Sophia Yacob and Roxy Mathew Koll from the Indian Institute of Tropical Meteorology (IITM), Pune, examined how temperature, rainfall, and humidity affect dengue in Pune, a major hotspot of the disease.

They found that dengue infections and deaths increase when temperatures go above 27 degrees Celsius, rainfall is moderate and spread out over time and humidity is between 60 and 78 per cent during monsoon (June–September). The scientists created a model using artificial intelligence and machine learning that can predict dengue outbreaks more than two months in advance. This allows local authorities and health departments to prepare in time and reduce the impact of the disease.

In Pune, the average temperature ranges from 27–35 degrees Celsius during monsoon. This range is conducive for dengue transmission because it affects how long mosquitoes live, how many eggs they produce, and how quickly the virus develops inside them. It also influences how long it takes for people to show symptoms after being infected. The researchers noted this temperature range is specific to Pune and will differ in other places because various factors -- like rainfall and humidity -- vary. Therefore, it's important to study the climate-dengue link for each region separately.

The study shows moderate rains (up to 150 mm in a week) increase dengue deaths because they cause stagnant water that mosquitoes use to breed. Heavy rains (more than 150 mm in a week), however, reduce dengue by washing away eggs and larvae. Monsoon rainfall in India has active (wet) and break (dry) phases. Years with fewer active and break phases (meaning rainfall is more evenly spread out) see higher dengue cases and deaths. Years with more of these phases (meaning more rain in short bursts) see fewer dengue cases and deaths, the scientists found. So, it is not just the total amount of rain that matters, but also how the rain is spread out over time. Currently, the India Meteorological Department (IMD) issues forecasts for these active-break cycles 10–30 days in advance for the whole country. Using these forecasts can give extra time to predict dengue outbreaks.

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In the future, scientists say temperatures and humidity in India will continue to go up, and monsoon rains will become more erratic, with more heavy rainfall. While these heavy rains might wash away some mosquito eggs and larvae, overall warmer days will likely boost dengue transmission. Under scenarios with both low and high fossil fuel emissions, Pune could see its average temperature rise by 1.2–3.5 degrees Celsius by the end of the century.

Several states with a high dengue burden -- such as Kerala, Maharashtra, West Bengal, Karnataka, Tamil Nadu, Gujarat, Punjab, Haryana, Andhra Pradesh, Telangana, Rajasthan, and Uttar Pradesh -- could benefit from an advanced early warning system. This would improve their readiness and reduce the disease's effects, the scientists said.