

Beyond dengue: The mosquito-borne virus that could be our next big outbreak

Singapore researchers at Sri Lanka's chikungunya front line find there's a need for greater regional coordination and increased funding.

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Every year, Singapore braces itself for its familiar battle against dengue. But another mosquito-borne virus is quietly gaining ground across the tropics – one carried by the same *Aedes* mosquitoes that thrive here. Chikungunya, long overshadowed by dengue, is re-emerging with new mutations, more severe symptoms and a worrying ability to spread in urban environments.

Already, Singapore has experienced a spike in chikungunya cases, with 17 reported from the start of the year to Aug 2 – more than double the number for the same period in 2024, said the Communicable Diseases Agency. This follows a recent chikungunya outbreak in Guangdong, China, with cases subsequently reported in Taiwan and Hong Kong.

Singapore's ability to respond effectively to chikungunya depends not only on domestic measures, but on understanding how the virus is behaving in neighbouring regions before it reaches our shores.

To this end, the co-authors of this commentary – comprising a joint team from Duke-NUS Medical School's Centre for Outbreak Preparedness (COP), Nanyang Technological University-Singapore's Lee Kong Chian School of Medicine (LKCMedicine), Woodlands Health and the A*Star Infectious Diseases Labs (A*Star IDL) – are undertaking research in Sri Lanka, where a large outbreak of chikungunya emerged in late 2024.

This research is giving Singapore an early window into the virus' mutations, patterns of

spread and its clinical impact.

Singapore has taken important steps to stay ahead of mosquito-borne diseases, but regional preparedness still faces gaps. Surveillance, diagnostics and research all require sustained investment, and without this, countries risk being caught off guard should chikungunya spread more widely.

Singapore's proactive approach is vital, yet it will be most effective when matched by strong, coordinated efforts across the region.

DANGERS OF THIS PARTICULAR STRAIN

In Sri Lanka, the joint team built on Duke-NUS' long-running collaborations in disease surveillance with local researchers.

When partners there raised the alarm, Singapore scientists specialising in mosquito-borne diseases quickly mobilised to study the outbreak and help fill urgent knowledge gaps. Their response was shaped by history: in the last major Asian outbreak of 2007-2009, chikungunya spread from South Asia to South-east Asia within a year.

While the virus is rarely fatal, doctors in Sri Lanka are now seeing patients more frequently with chronic, crippling joint pain, and in rare cases, neurological symptoms or multi-organ complications. These severe conditions appear to be reported more often than during the 2007-2009 outbreak. There have also been rare instances of mother-to-child transmission during pregnancy.

The outbreak in Guangdong adds urgency, with more than 7,000 cases reported. Sri Lanka's current experience, with patients suffering severe and prolonged illness, underlines how disruptive chikungunya can be once it takes

hold. In an ageing population like Singapore's, a virus that leaves lasting joint damage or neurological issues could have significant social and economic impact.

This outbreak is also revealing a broader challenge: the co-circulation of chikungunya, dengue and leptospirosis – a risk wherever these pathogens overlap. All three share early symptoms such as fever, fatigue, body aches and joint pain, yet each requires different treatment.

Misdiagnosis can be fatal, as the illnesses are hard to distinguish in their early stages and rapid, reliable diagnostics are often lacking. In Sri Lanka, some patients are testing positive for more than one of these pathogens at the same time, adding to the strain on health systems.

This overlap in symptoms makes it challenging for clinicians to provide proper care. What is urgently needed is a coordinated regional effort to develop and validate point-of-care diagnostics, so that doctors can quickly distinguish between these diseases and give patients the right treatment.

WHAT ELSE HAS CHANGED WITH THE NEW STRAIN?

Early sequencing in Sri Lanka has detected genetic mutations in the current chikungunya strain not seen during the 2007-2009 outbreak.

Recent genomic studies confirm that today's virus belongs to the Indian Ocean lineage, carrying changes that make it spread more efficiently through *Aedes aegypti*

– the same mosquito that transmits dengue in Singapore.

Scientists have also identified several unique mutations not seen before, though it is still unclear how these may affect severity or transmission.

Field observations also suggest it is now spreading more in densely populated cities, rather than staying confined to suburban areas. These findings are still being investigated, but they raise important questions for public health planners.

A COORDINATED REGIONAL RESPONSE

By working alongside Sri Lankan hospitals, universities and public health agencies, the Singapore team is helping to build the evidence base needed to act

quickly and proportionately should chikungunya arrive here. Being prepared is not a distant goal, it is the work being done right now.

Together with front-line hospitals, universities and government agencies in Sri Lanka, the team is working to strengthen diagnostics, track viral changes and connect lab findings with what doctors are seeing in patients.

From sequencing the virus to running clinical studies and mosquito experiments, the work in Sri Lanka and across the region is providing vital insights to guide outbreak response.

This intelligence allows our health authorities to anticipate potential scenarios here, refine diagnostic and vector-control strategies in advance, and protect vulnerable groups.

The focus is on understanding how this outbreak is unfolding, including which patients are most likely to fall seriously ill, what early warning signs to look for, and how the body's immune response might guide better mosquito control and faster diagnosis.

In addition, the team is taking a multi-country research approach, working with partners in Vietnam, Indonesia, Nepal and the Philippines to help estimate the hidden burden of chikungunya and to strengthen health systems.

PREVENTION: WHAT CAN BE DONE NOW

Like dengue, chikungunya prevention relies on controlling *Aedes* mosquitoes – from eliminating breeding sites to advancing new tools that limit their ability to spread disease. This matters because the current strain of chikungunya appears to have developed a mutation that could potentially help it spread more easily through *Aedes aegypti*, though scientists are still studying this closely.

While two chikungunya vaccines have been approved for use overseas, they are not yet available to the general population in Asia. For now, the

strongest defences remain mosquito control, early diagnosis and protecting those most at risk.

For health systems, preparedness also means improving diagnostic capacity to quickly distinguish between dengue, chikungunya and leptospirosis, monitoring mosquito populations to target control measures, and identifying communities most at risk of severe disease.

PREPARING BEFORE IT'S TOO LATE

But science and surveillance alone are not enough. Effective prevention also means confronting a growing challenge: the sharp reduction in global funding for outbreak preparedness, especially in low- and middle-income countries where chikungunya is now circulating.

Even before these cuts, a Duke-NUS study found that outbreak detection in Asia was already under-resourced and today, resources are likely even tighter.

What is urgently needed is sustained investment, particularly for countries on the front lines, to strengthen surveillance systems, track how the virus is mutating, understand how it causes disease in humans, and develop medical countermeasures such as diagnostics and treatments.

Without such support from global donors and international partnerships, affected countries are left struggling to respond with limited tools, increasing the risk that the whole region will be caught off guard when the next outbreak spreads.

Although chikungunya does not raise the prospect of a pandemic, as it does not spread person to person, it could result in a large outbreak across the region.

Building preparedness is vital – it saves more lives and costs far less than initiating an emergency response only after an outbreak is under way. Without it, the region risks losing the ability to respond with evidence, speed and scale.

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Like dengue, chikungunya prevention relies on controlling *Aedes* mosquitoes – from eliminating breeding sites to advancing new tools that limit their ability to spread disease, the writers say. ST PHOTO: LIM YAOHUI