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Dengue vaccines in India: A look at the ongoing trials and development

At present, there are three dengue vaccine candidates that are being tested in humans in India. There are at least two indigenous vaccines against dengue under development in research institutes.

Written by **Anonna Dutt** [Follow](#)

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Patients suspected of dengue undergo treatment at Santipur Hospital, in Nadia, West Bengal, August 25, 2023. (PTI Photo)

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With the expanding geography of dengue infections — in India as well as the world — an increasing need has been felt for an effective vaccine that can protect against all four serotypes. Nearly half the population of the world lives at risk of the disease at present.

The disease in India has spread from just eight states and union territories in 2001 to all states by 2022 — **Ladakh was the last bastion from where two infections were reported last year.** There have been 31,464 cases and 36 deaths due to dengue reported across the country till the end of July this year, as per the latest available data.

There are several efforts ongoing within the country to develop an effective vaccine against the mosquito-borne disease that can lead to internal bleeding, circulatory shock, and death.

Dengue 101: Symptoms, treatment and prevention

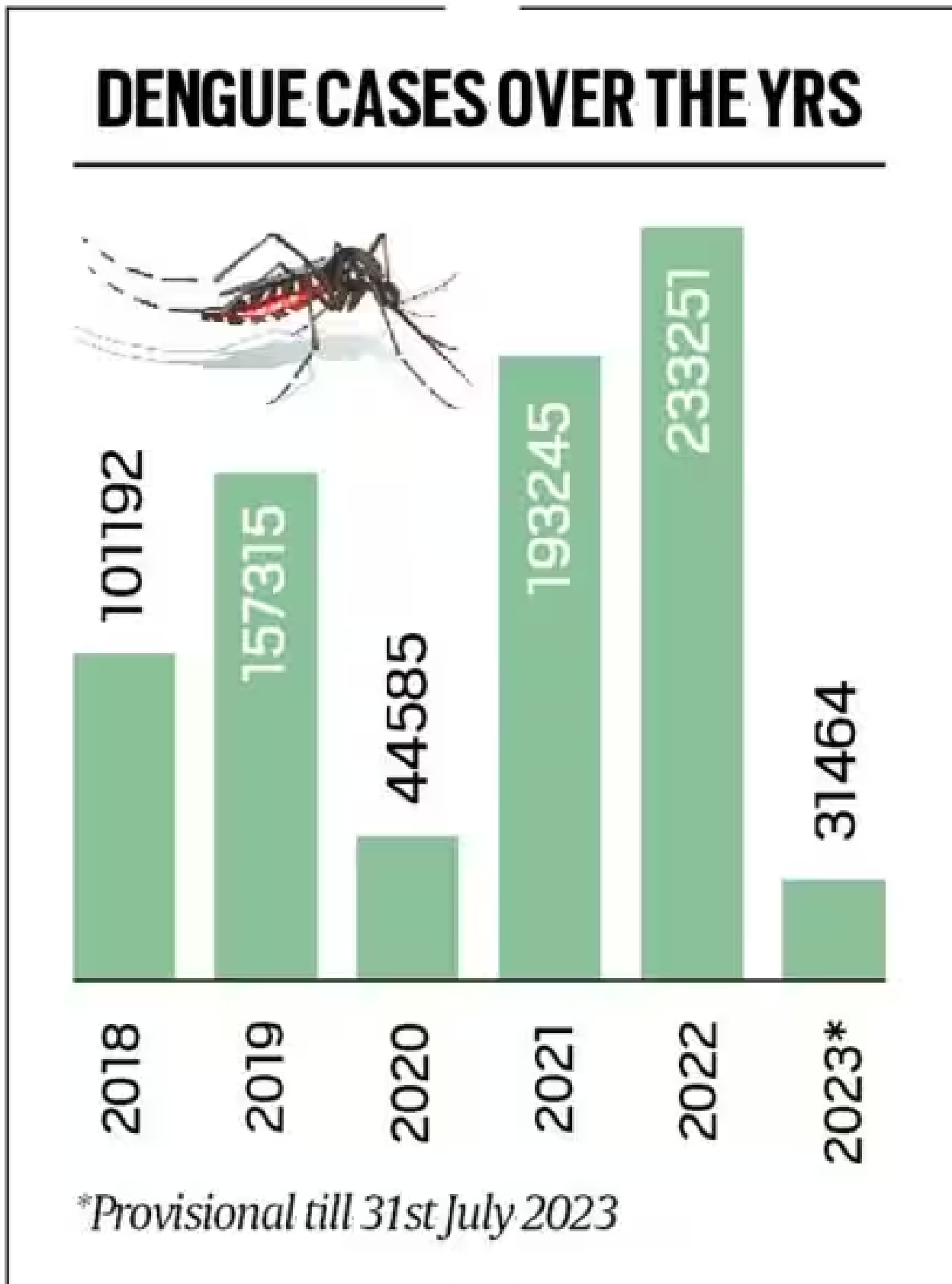


Vaccine in human trials

At present, there are three vaccine candidates that are being tested in humans in India.

First, a vaccine developed by **Panacea Biotec** based on live weakened versions of the four dengue serotypes developed by the National Institute of Allergy and Infectious Diseases in the United States. The US laboratory developed weakened versions of all four dengue virus serotypes — they deleted parts of the genetic code of DENV1, DENV3, and DENV4 serotypes of the virus to do so and then genetically engineered DENV2 backbone using parts from weakened DENV 4 on which the

others were tacked on. These were grown in cell culture by Panacea Biotec to develop the vaccine.



Data source: National Center for Vector Borne Diseases Control. Express graphic: Prasanta Bhowmik

The company has already completed a phase I/II study in 100 healthy adults between 18 and 60 years of age. This showed that there were no severe adverse events and more than 75% of the participants developed antibodies against all four of the dengue serotypes.

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A larger phase III trial is likely by December this year after they scale up their manufacturing capability. The trial will be conducted across 20 sites in the country enrolling 10,335 healthy adults between the ages of 18 and 80 years.

A second vaccine candidate was developed by the Serum Institute of India with the same weakened virus from the United States. A phase I trial with 60 healthy adults of 18 to 45 years has already been completed, showing the vaccine to be safe and well tolerated. After phase 2, the company with ICMR will conduct a large-scale study with the help of ICMR in children between the ages of 2 to 18 years.

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The same technology has also been used by Indian Immunologicals Limited to develop a vaccine that has started the phase I clinical trial in 90 persons between

the ages of 18 and 50 years.

Vaccines in the early stages of development

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There are at least two indigenous vaccines against dengue under development in research institutes. Both have used similar ideas to come up with different types of vaccines.

One of the main challenges of developing a dengue vaccine is antibody-dependent enhancement (ADE) — a person with low levels of antibodies against one serotype of dengue, may end up getting a more severe infection with another serotype of dengue. This was what led to controversy surrounding the first dengue vaccine to be approved. Only after a vaccination programme had been rolled out in the Philippines, it was found that the vaccine could actually increase the risk of severe disease in people who had not been infected before.

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To do away with this problem, both the Indian research teams selected a specific part of the envelop protein known to not cause ADE. The team from the International Centre for Genetic Engineering and Biotechnology (ICGEB) created a Virus-Like Particle using these parts of the virus. The vaccines were shown to offer almost 100% protection against all four serotypes. This has been tested in mice and monkeys but is yet to be tested in humans. The vaccine was developed in collaboration with Sun Pharmaceuticals.

The other team from Tata Institute of Fundamental Research and Rajiv Gandhi Centre for Biotechnology among other institutes again used the same envelope parts of the four dengue virus along with another part called non-structural-1 and constructed a genetic sequence out of it. This resulted in a DNA vaccine with all four serotypes. Although DNA vaccines can be manufactured at lower safety levels, at a lesser cost, and can be stored even at room temperatures, they don't always produce a very good immune response. This is the reason most DNA vaccine candidates failed until the success of the Zydus COVID-19 vaccine.

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The researchers are currently optimising the vaccine using nano-plasmids. The vaccine candidate has already been tested on mice.

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