THE TIMES OF INDIA

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FROM TOI PRINT EDITION

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June 25, 2021, 9:23 PM IST / Malathy Iyer in TOI Edit Page, Edit Page, India, TOI

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Why is genome sequencing so important?

Sequencing provides proof how much the sample under study has changed from the original Wuhan virus strain, and whether mutation at a particular gene will result in hig infectivity. That informs policy, for example, whether or not to lock down, and it is also vital for designing more effective vaccines.

What is global best practice on sequencing?

The best strategy is to sequence 5% of all Covid-positive samples. Britain leads the race here. The Covid-19 Genomics UK Consortium website says 5,69,877 viruses have been sequenced so far and its daily graphs clearly capture the emergence of the Delta (B.1.617.2) variant as the most dominant one. Other developed countries such as the US and Australia too have sequenced 5% or more of the positive samples.

How does India fare?

The Indian Covid-19 Genome Surveillance, maintained by the CSIR Institute of Genomics & Integrative Biology (IGIB) in Delhi, says that until June 21, 30,483 genomes were sequenced mainly for INSACOG Covid surveillance project and the Kerala government's GENESCoV2 project. This is a tiny fraction of the 3-crore Covid cases detected in India since March 2020. To be fair to scientists involved, India began its surveillance in earnest from December 2020.

IGIB director Anurag Agrawal says the 5%rule hasn't been INSACOG's plan for quite a while. He said the idea is to carry out "fixed sampling by time and geography'' plus strategic "deeper'' sampling when needed. He has often been quoted as promoting "smart sequencing".

What are the shortcomings in India's approach?

Some in the scientific community fear positive samples are picked up randomly for sequencing, instead of undertaking "scientific" sampling. Mumbai-based Foundation for Medical Research's Nerges Mistry, credited with pioneering work in TB genomics, advocates cluster-based testing: If there are a number of cases in a small geographic area – say, a school or a residential building – then the need is to pick up 80% of all the positive samples from this area for sequencing to find out if a variant is at work.

Another concern is that there is no special focus on the most vulnerable subgroup of patients – those who contract Covid while under treatment for major diseases. Experts say such patients would be the 'best' reservoir for the SARS-CoV-2 virus to linger longer and start mutations to enhance its survival.

Plus, there has been widespread criticism from the scientific community on the failure to rope in the private sector to speed up the sequencing project.

What holds us back ? Funding ? Infrastructure ?

Funding is a problem. When the INSACOG consortium of 10 elite research labs was set up around six months ago to do Covid sequencing, the Centre earmarked Rs 115 crore for a six-month period. The allocation did not take place and the Department of Biotechnology was asked to fund the consortium from its own resources.

Genome sequencing is expensive. In the private sector, genomic tests to check for disorders (including for lifestyle diseases and cancer) run into tens of thousands of rupees. Newer technologies that allow huge numbers of samples to be sequenced at once could bring down the costs to under Rs 5,000, but such upgrades haven't yet taken place. Recurring costs of reagents (some of them have to be imported) are also a concern.

The second problem is capacity. While the IGIB has the capacity to do 10,000 sequences a month, there is no clarity on the capacity of other labs. Sequences are relatively speaking simple to do, but given India's size and huge volume of patients, scientists believe the private sector should be roped in for the purpose.

Logistics are also a nightmare. How quickly can samples from rural areas be transferred to sequencing labs is an issue.

What are the fastest ways to improve India's efforts?

One solution will be to rope in other labs with the technical knowhow to sequence more. Another suggestion is to create linkages: Smaller local labs can start off the process and transport a stabler sample to bigger labs for the final workup and diagnosis.

Then there is the option of starting wastewater monitoring, which is cheaper than individual sequencing, at least in high-load cities such as Mumbai and Delhi. IIT Gandhinagar recently showcased its wastewater surveillance for Covid through the detection of the genetic material of SARS-CoV-2.