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# SHOULD INDIA STUDY WASTEWATER TO TRACK MALARIA, DENGUE?

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Wastewater surveillance is an excellent tool to monitor the presence of specific pathogens well before they can be detected through laboratory testing. It has been routinely used for decades for tracking the polio virus in almost every country. Water-borne viruses can be best studied through testing sewage samples. If wastewater surveillance provides accurate information about the presence of polio virus excreted by humans, in the case of other pathogens, for instance SARS-CoV-2 virus, it helps provide information on new variants and virus load which serves as a proxy for the extent of virus spread in the community. The biggest advantage of wastewater surveillance is that it is cost-effective and can independently confirm the presence of pathogens before laboratory testing throws up a warning signal.

For instance, wastewater surveillance carried out by the Tata Institute for Genetics and Society (TIGS) in Bengaluru was able to detect a silent wave of the XBB.1.16 Omicron variant in the city last year. The virus variant began increasing in early-March last year and peaked on April 1.

With the usefulness of wastewater surveillance during the pandemic established, researchers in developed countries have used it for tracking other diseases such as monkeypox, influenza and cholera. In a paper published in November last year in the journal *Science Translational Medicine*, researchers in the U.S. have suggested that wastewater surveillance be expanded to track dengue, malaria, Zika and typhoid.

Should India too use wastewater surveillance to track vector-borne disease like the developed countries? “The U.S. and Europe don’t have much dengue and are unlikely to test fevers for dengue or malaria unless they know it is around (which may happen from environmental surveillance). In India, these are endemic diseases, so the questions that can be addressed by environmental surveillance need careful consideration since clinical cases are likely to be tested for known causes,” says Dr. Gagandeep Kang, former Professor at CMC Vellore.

In a paper published in the journal *Trends in Parasitology*, Dr. Farah Ishtiaq from the Bengaluru-based Tata Institute for Genetics and Society, which has been using wastewater surveillance to study SARS-CoV-2 burden in Bengaluru, says that employing wastewater surveillance for vector-borne pathogens should take into account the geographical context, pathogen biology, and the availability of sewage networks.

There have been recent outbreaks of malaria and dengue in the U.S., and Portugal. However,

the U.S. and European countries rarely report malaria and dengue. The developed countries also have excellent sewage networks, which makes it easy to track these pathogens. Finally, transmission is seasonal, if at all.

But in India, malaria and dengue are endemic and pathogen transmission takes place almost throughout the year. “Importantly, besides people shedding the pathogens through stools, there are several mammals, including nonhuman primates, that serve as reservoir hosts of malaria and dengue. So in a tropical country like India, it is difficult to say that all the malaria and dengue microbes detected in wastewater are excreted only by humans,” Dr. Ishtiaq says.

In the case of dengue, virus shedding by humans is low. This makes it difficult to detect dengue viral RNA in wastewater at levels similar to SARS-CoV-2 RNA. “Using wastewater surveillance to detect malaria or dengue pathogens and find the actual burden of the disease in the community in a setting like ours is a challenge,” says Dr. Ishtiaq.

“For vector-borne diseases, wastewater surveillance is not enough. Where we are trying to solve the problem through vector surveillance, mosquito surveillance should not be sidelined and wastewater surveillance be seen as a solution.” Unlike water-borne pathogens such as rotavirus and hepatitis which are passed through human excreta, vector-borne diseases that have other reservoir hosts will be a challenge to study through wastewater surveillance, she adds. Though animals serve as hosts for malaria and dengue across the world, the diversity of animal hosts in tropical countries is in no way comparable to temperate countries.

“There is a huge push to identify priority pathogens for wastewater surveillance, which is welcome for water-borne diseases, influenza, etc. But if asked to prioritise dengue and malaria I will think hard as I know that the signal I will get will not exclusively be from humans,” Dr. Ishtiaq stresses. One of the key criteria for the selection of priority pathogens of wastewater-based surveillance is that pathogens are stable in the wastewater and are consistently shed in the faecal material or urine.

In August 2022, besides the SARS-CoV-2 virus, Bangladesh launched a proof-of-concept wastewater surveillance programme to track and monitor three other vaccine-preventable pathogens including *Salmonella typhi*, *Vibrio cholerae*, and rotavirus in the communities.

“When selecting priority pathogens of wastewater surveillance, it is essential to consider the limitations and challenges that arise from different sanitation systems and host-parasite geography before drawing conclusions from wastewater surveillance data,” she writes.

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