

New zoonotic coronavirus pandemic: the application of wastewater-based epidemiology (WBE) from the perspective of One Health

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Viability of the WBE approach in monitoring the new coronavirus along with epidemiological surveillance

Abstract Reference
PP17

BACKGROUND

The new zoonotic coronavirus (SARS-CoV-2) was detected in China in late 2019 and, since then, it has spread rapidly, culminating in the pandemic. Studies show that symptomatic or asymptomatic individuals infected with SARS-CoV-2 can eliminate the virus through feces and urine, making it possible to detect viral RNA in excreta and, consequently, in wastewater. One Health is the inseparable union of animal, human and environmental health and within this concept, it is possible to use an environmental sample (wastewater) to monitor the circulation of the new coronavirus in a population, whether in companies, schools, neighborhoods, and municipalities. In this context, the present study aimed to demonstrate the successful use of WBE through a contingency plan model adopted in a company (Itaipu Hydroelectric Power Plant - IHPP) located in the city of Foz do Iguaçu, Brazil.

METHODS

Ten points were monitored weekly between June/2020 and September/2021, in order to represent each sector of the IHPP. For 65 weeks, five hundred milliliters of samples were sent conditioned on ice to the Federal University of ABC for standardization, detection and quantification of RNA fragments of the new coronavirus. These samples were concentrated by precipitation with polyethylene glycol (PEG) by centrifugation. The viral nucleic acid was recovered through purification in columns, using a commercial kit (PureLink® RNA Mini kit - Thermo Fisher) (1). The detection and quantification of viral RNA was performed by RT-qPCR, using a commercial kit (2019-nCoV TaqMan RT-PCR from Norgen), directed to the N1 and N2 targets (gene encoding the viral nucleocapsid protein) (2,3).



Concentration (PEG + centrifugation)
Extraction and Purification of RNA
Detection and quantification by RT-qPCR

RESULTS

Figure 1 shows the total SARS-CoV-2 load, sum of the loads of all monitoring points at the UHI. To support decision-making, weekly charts are also produced, showing the status of each monitoring point. These graphs also show the number of clinical cases reported for each region/monitoring point of the IHPP.

An occurrence variation of 7.7 and 2.6 log₁₀ copies of RNA.L⁻¹ was observed, and it is possible to correlate with the tendency of an increase in the number of cases in the IHPP and in the city of Foz do Iguaçu (Fig 1). The results demonstrated the viability of the WBE approach in monitoring the new coronavirus, being a useful tool for decision-makers with the epidemiological surveillance and the health department.

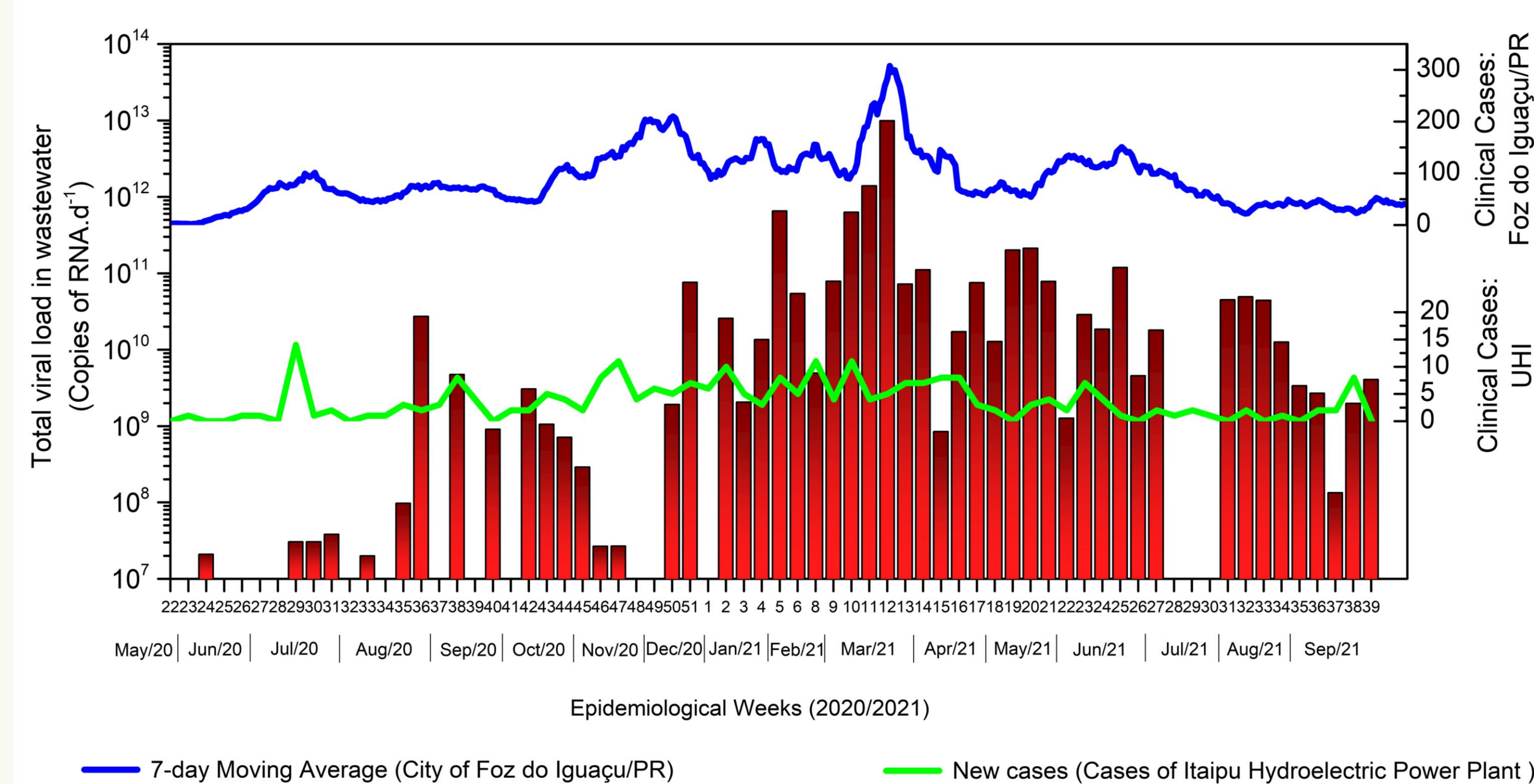


Figure 1: Total viral load in the IHPP sewage compared to clinical cases.

Surveillance of waterborne diseases is a remote activity, carried out since the beginning of the 19th century. Even though the fecal-oral transmission route is not one of the main characteristics of Covid-19, it is a warning that the occurrence of waterborne diseases can be minimized or even avoided through the adoption of adequate sanitation practices, treatment conditions and water supply and personal hygiene, the latter being essential for the prevention of the new coronavirus, together with vaccination and the use of masks and 70% alcohol.

CONCLUSIONS

After analyzing the results, it was possible to obtain subsidies for the elaboration of dynamic maps (georeferenced) to monitor the spatial and temporal evolution of the occurrence of COVID-19. The monitoring results are disseminated through epidemiological bulletins for the population and health managers. In order for it to be used as an effective intervention system, an integrated multidisciplinary work involving health and environment agencies is necessary for effective decision-making in the prevention and control of COVID-19. The WBE approach may also be useful in detecting outbreaks caused by other waterborne pathogens not only in the human population but also in the companion animal population – perspective of One Health.

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MORE INFORMATION / REFERENCES

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