



0260

SARS-CoV-2 From Pediatric Dental Clinic Wastewater: Insights Into Asymptomatic Children

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Objectives Asymptomatic COVID-19 in children poses a public health challenge due to potential for rare severe cases and risk of transmission. However, information on asymptomatic cases among children was unknown. It was hypothesized that wastewater from pediatric dental clinics could contain traces of the virus from saliva of asymptomatic children. To assess effectiveness of detecting SARS-CoV-2 RNA in wastewater from a pediatric dental clinic to estimate the number of local asymptomatic cases in children.

Methods This prospective longitudinal observational study was conducted at Meikai University Hospital, the sole dental hospital in Saitama Prefecture, Japan. The study focused on the Pediatric Dental Clinic, where most patients were under 10 years old. Wastewater samples were collected every Saturday, total 60 samples from Week 11 of 2021 to Week 21 of 2022. The samples underwent concentration, extraction, and purification to isolate viral RNA, which was then tested for SARS-CoV-2 RNA using real-time RT-PCR. The study explored the correlation between the weekly count of cases in children under 10 in Saitama Prefecture (the exposure) and the detection of SARS-CoV-2 RNA in wastewater (the outcome). It also identified the SARS-CoV-2 subtypes present in the wastewater.

Results SARS-CoV-2 RNA was detected in the wastewater. Out of 58 samples analyzed, 30.5% (17/58) tested positive and 69.5% (41/58) were negative. Two samples were excluded due to sampling errors and failures in detection process. Among under-10 population of Saitama Prefecture, which numbered 571,180 at baseline, there were 81,780 cumulative cases during survey period. The study period saw three pandemic waves (the 4th, 5th, and 6th, associated with Alpha, Delta, and Omicron variants, respectively), though the 4th wave was less pronounced. A significant association was found between the number of cases and SARS-CoV-2 RNA positivity in wastewater (Fisher's exact test, $p < 0.001$). The Omicron variant was identified in a sample from Week 8, 2022.

Conclusions Wastewater analysis from a pediatric dental clinic offers valuable insights into presence of asymptomatic COVID-19 among children. This method can complement data from clinical pediatrics, enhancing our understanding of spread and prevalence of the virus in this demographic.