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# Airborne SARS-CoV-2 in patient rooms during the Omicron wave compared to early variants

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The covid-19 pandemic was characterized by a series of variants of concern, different strains of SARS-CoV-2 which had a serious impact on transmission. One of these, denoted Omicron, dominated in early 2022 and caused covid-19 cases to soar. The increased transmission during the Omicron wave triggered hospitals to further strengthen airborne precautions. The reason for this surge in cases during Omicron is still not clear, but proposed explanations include increased emissions of virus in exhaled air, improved viability in air, or structural mutations of the spike protein that promote infection efficiency at the target cells.

We have previously reported findings of airborne SARS-CoV-2 in patient rooms during the primary wave, when the ancestral strain was dominant, and during the introduction of the Alpha variant [1]. The aim with this study was to compare the positivity rate of air samples in patient rooms during the Omicron and ancestral waves.

**Methods**

Air samples were collected in patient rooms at predefined distances of 1, 1-2 or 2-4 meters from the patient's head with a liquid cyclone (Coriolis µ, Bertin Instruments, France). The cyclone operated at 200 L/min for 10 minutes, with 15 mL of phosphate-buffered saline solution as collection liquid, in single-use collection vials.

Patient data was noted, for example the cycle threshold (Ct) value of the most recent nasopharyngeal swab containing SARS-CoV-2, virus subvariant, and ongoing medical procedures during air sample collection. SARS-CoV-2 RNA content was analysed by RT-qPCR targeting the E-gene.

To explore differences between air samples collected from patients with ancestral and Omicron infections, we used logistic regression and Chi2 test in STATA SE/15.1 (StataCorp, College Station, TX, USA).

**Results and discussion**

75 air samples from 43 patients were collected in this study, and four samples were positive for SARS-CoV-2 RNA (5%). The air samples collected during earlier strains showed a positivity rate of 10% (22/231 samples) [1]. The positive samples were found at three of the 43 patients, compared to our previous study during the ancestral period where 17 of 88 patients (29%) had at least one positive air sample (OR 0.31, CI95% 0.06-1.2, p=0.07).

We could not find any differences between proportions of SARS-CoV-2-positive air samples during the Omicron wave and the primary wave (OR 0.54, CI95% 0.18-1.6, p=0.27) when comparing with our previous study in the same area, even when adjusting for patient characteristics and setting.

To our knowledge, this is the largest investigation of airborne SARS-CoV-2 of the Omicron variant in patient rooms. However, strong conclusions are limited by the small number of positive air samples.

Previous studies have investigated exhaled emissions of different variants of SARS-CoV-2, and found increased emissions from later variants [2-3]. However, individual variability in viral load is high, and differences in the number of days since symptom onset for the measured patients can affect the results. Other drivers might explain the increased transmission, such as increased viability in air, different shedding dynamics, or spike protein mutations for higher infection efficiency.

**Conclusions**

In this study, the positivity rate of air samples collected in patient rooms with patients infected with the Omicron strain was equal to or lower compared to earlier variants. Based on these results, it appears unlikely that the increased transmission observed during the Omicron wave is caused by increased virus emissions alone.

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**References**

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