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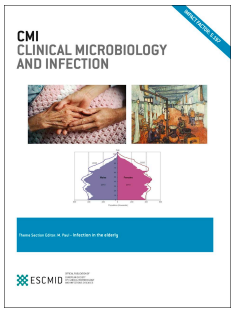

The disease burden of Delta and Omicron variants of SARS-CoV-2 in a Predominantly Vaccinated and healthy cohort

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The Disease Burden of Delta and Omicron Variants of SARS-CoV-2 in a Predominantly Vaccinated and Healthy Cohort

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To The Editor

Since February 2021, we have been studying the seroprevalence of anti-SARS-CoV-2 antibodies in a cohort of individuals employed by the Cantonal Police Bern in Switzerland. The baseline study (February 2021), the 3-month (May 2021), and 6-month (September 2021) follow-up visits correspond to the first, second, and third cross-sectional analyses of the cohort, as previously reported [1, 2] (**Supplementary Figure 1**). Here, we present the SARS-CoV-2 infection and vaccination rates at the 9-month (fourth cross-sectional analysis, in December 2021) and 12-month visits (fifth cross-sectional analysis, in March/April 2022) and estimate the SARS-CoV-2 burden within the cohort after the Delta and Omicron surges.

The cohort population includes 1022 study participants. The mean age is 41 (SD 8.8) years, 72% are male, and 76% have no comorbidity. The serological methods and questionnaires were used as previously reported [1, 2] (**Supplementary Material**).
From late June 2021, the SARS-CoV-2 Delta variant (B.1.617.2, all subvariants AY) was dominant in Switzerland until its replacement by the Omicron sublineages BA.1 and BA.2, which became predominant from mid/late December 2021 till mid-February and the beginning of April 2022, respectively (**Supplementary Figure 2**).

The SARS-CoV-2 infection rate per 3 months was defined as (i) seroconversion of anti-NCP antibodies or (ii) a self-reported PCR test from a nasopharyngeal or saliva sample. The proportion of positive agreement (PPA) between the two modalities was evaluated and adjusted when seroconversion occurred at later follow-up visits. To estimate the SARS-CoV-2 burden (including the disease and non-disease consequences), we evaluated the proportion

of study participants who reported symptoms, sought a medical doctor, required hospitalization, and missed work or police academy because of COVID-19.

At the 9-month visit, the seroprevalence of anti-NCP antibodies was 19.1% (n=188/985; 95% confidence interval [CI] 16.7%–21.5%). Anti-NCP seroconversion was identified in 4.8% of samples (n=47, 95% CI 3.6%–6.3%). Twenty-one individuals without seroconversion reported a positive PCR test result from a nasopharyngeal or saliva sample, 16 of them showed seroconversion at the 12-month visit. Hence, the infection rate within the previous 3 months was 6.9% (68/985; 95% CI 5.5%– 8.7%), and the adjusted PPA for PCR test results and seroconversion was 92.6% (63/68).

At the 12-month visit, the seroprevalence of anti-NCP antibodies was 51.6% (n=499/967; 95% CI 48.5%–54.7%). Anti-NCP seroconversion was identified in 32.7% of samples (n=316, 95% CI 29.2%–35.1%). Sixty individuals without seroconversion reported positive PCR test results. After excluding the 16 individuals with a positive PCR test at the 9-month and seroconversion at the 12-month visit, the infection rate within the previous 3 months was 37.2% (360/967, 95% CI 34.2%–40.3%). PPA was 83.3% (300/360) and could not be adjusted for late seroconversion, because the study ended after the fifth cross-sectional analysis.

To assess these infection rates in view of 2 parameters for protective immunity, we evaluated (i) vaccine rates and (ii) the presence of anti-Spike(S) antibodies 2 weeks prior to the start of each cross-sectional analysis (**Figure**). The increase in vaccination rate for the first (1.9%) or second (3.1%) dose between the 9- and 12-month visit was minimal. The proportion of individuals with a booster, however, rose from 0.6% to 60% 8 weeks and to 63.3% 2 weeks

prior to the 12-month visit. The corresponding results of the anti-S-antibodies are shown in the **Figure**.

At 12-month-visit, we found no statistically significant difference between infection rates among individuals with a booster vaccine dose (36.6%; 242/661) and those without (38.6%, 118/306; difference 2.0%, 95% CI 4.6%–8.5%, $P = 0.559$).

At the 9-month visit, 0.5% of the study participants reported having had no symptoms, and at the 12-month visit, 2.0% did so. At the 9-month-visit, 6.1% reported that they sought a doctor appointment, 16.3% that they missed working days (or school days at the police academy), and 1.2% that they were hospitalized because of COVID-19. After the 12-month-visit, the proportions were 7.3%, 33.4%, and 1.8%, respectively. The median numbers of missed working days were 7 (IQR 2–10) days during the Delta surge and 4 (IQR 2–5) days during the Omicron surge.

This study evaluated the burden of the Delta and Omicron surges in a healthy population cohort with a relatively high vaccination rate. During the Omicron surge, an infection rate of 37.2% (95% CI 34.2%–40.3%) was noted in the cohort within 3 months, despite the fact that more than 88% had 2 doses of mRNA vaccine and more than 63% had an additional booster dose. The seroprevalence of anti-NCP antibodies rose from 15% in September 2021 to 19% in December 2021 to 52% in March/April 2022 (**Supplementary Figure 1**). The latter number is likely underestimated, considering that 60 (6.2%) study participants tested positive for SARS-CoV-2 in a nasopharyngeal or saliva sample and did not (yet) reveal seroconversion at the time of serum sampling.

The high infection rate observed from January to March/April 2022 is likely due to the transmissibility and immunologic escape properties of the Omicron variant [3]. The disease and non-disease consequences of the Delta and Omicron variants in a defined cohort has not previously been quantified. From a disease perspective, these data reinforce previous findings and support information statements by health authorities that COVID-19 remains protective against hospitalization and severe infection [4]. From a non-disease perspective, considerable work absences within 3 months were observed, illustrating the disruption potential of Omicron for emergency service providers.

Because we found no difference in infection rate between non-boosted and boosted individuals within the 3-month window at which the Omicron variants were predominant, and because among the boosted group 95% received their third vaccine dose 8 weeks prior to the cross-sectional analyses, the results suggests that protection from non-severe Omicron infection is not durable. However, we are unable to confirm this conclusion, because we did not inquiry the precise infection dates in the questionnaires.

The data provided in this study are highly relevant for the preparation and management of large-scale absences in the workplace for both the public and private sectors [5]. They indicate that the SARS-CoV-2 burden may shift from hospitalization because of severe disease to work shortage because of Omicron variants.

Ethics

All participants signed written informed consent prior to enrollment in the PoliCOV-19 study. The collection of coded data and the design of the work were approved by the Cantonal Research Ethics Commission of Bern, Switzerland (ID-2020-02650). Trial registration: ClinicalTrials.gov NCT04643444.

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Conflict of Interest

None

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Figure 1 legend

Vaccine rates and the presence of anti-S antibodies of the police cohort in one year study period.

The blue bars (anti-Spike-antibody titers) are inserted at dates 2 weeks prior to the start of each cross-sectional analysis. The time points for anti-S antibodies are biased by the per protocol predefined serum sampling time points. Prior to the 9-month visit (i.e., after the third cross-sectional analysis), 87.0% of individuals displayed anti-S antibodies with a titer ≥0.8 U/mL, and 81% with a titer >250 U/mL. Prior to the fifth cross-sectional analysis (i.e., after the fourth cross-sectional analysis), 93.0% of individuals displayed anti-S antibodies with a titer ≥0.8 U/mL, and 88% with a titer >250 U/mL.

The red, green and purple curves illustrated the cumulative vaccine rates over time. The self-reported vaccine dates are collected from questionnaires. The vaccine rates are the values 2 weeks prior to the start of each cross-sectional analysis.

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