

asymptomatic COVID-19 individuals could be recommended (Table 1). Importantly, testing nonsymptomatic individuals may also cause false sense of security. To date, universal precautions such as hand and respiratory hygiene, self-quarantine when symptomatic or possible contact, social distancing, and use of masks are the best methods to mitigate COVID-19.

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Clinical characteristics and persistence of severe acute respiratory coronavirus virus 2 (SARS-CoV-2) IgG antibodies in 4,607 French healthcare workers: Comparison with European countries

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To the Editor—The safety of healthcare workers (HCWs) is a major challenge for healthcare systems. In the course of a severe acute respiratory coronavirus virus 2 (SARS-CoV-2) infection, immunoglobulin G (IgG) antibodies may be detected after a median of 14–24 days (interquartile range [IQR], 10–18) after onset of symptoms.¹

In France, the coronavirus disease 2019 (COVID-19) pandemic reached a peak on April 7, 2020. HCWs had mobility and flexibility inside the Paris Center university hospital, where there was a cluster in the pandemic. We investigated the prevalence of IgG antibodies against SARS-CoV-2 among all HCWs in this hospital. We also sought to determine the correlation between RT-PCR test and serology and to compare our seroprevalence with that of other European countries.

From May 14, 2020, to June 17, 2020, all HCWs were asked by the occupational health department to participate in serologic screening.

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The Abbott-Architect test (Abbott Laboratories, Abbott Park, IL) was used to detect IgG anti-SARS-CoV-2. During blood sampling, clinical information was recorded using a standardized self-questionnaire on presented symptoms, comorbidities, and the reverse-transcriptase polymerase chain reaction (RT-PCR) test if one had been previously performed. Blood samples were collected >28 days after the first symptoms from those who were symptomatic.

The seroprevalence and 95% confidence interval were estimated using the Fisher exact method. The *t* test and the χ^2 test were performed to compare quantitative and qualitative variables, respectively. Simple and multivariate logistic regressions were performed to assess risk and symptoms associated with seroprevalence respectively. Statistical analyses were performed using SAS software (SAS Institute, Cary, NC). The local institutional review board approved this study. All subjects participated voluntarily under pseudonyms.

Of 5,021 workers present during the study period, 4,607 (91.8%) were included in the study. The mean age was 41.8 years (SD, 12.6), and 75% were female. Furthermore, 45% were paramedical staff members, 36% were physicians (including medical students), and 19% were in administrative and other professions.

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Table 1. Comparison of Seroprevalence IgG in European Countries

Country, First Author	No. of Participants	Prevalence %	95% CI	Date of Blood Test	Population Type
Belgium, Blairon ⁶	1,494	1.6	NA	May 25–June 19	4 public hospitals
Belgium, Martin ⁷	326	11.0	NA	April 15– May 18	CHU Saint Pierre, Brussels
UK, Bampoe ³	200	14.5	9.9–20.1	May 11–June 5	Maternity, London
Germany, Korth ²	316	1.6	NA	March 25– April 21	Essen Hospital, tertiary-care
Germany, Lackermair ⁹	151	2.6	0.8–7.1	April 2–6	Outpatient center, Dachau
Germany, Schmidt ¹	385	2.9	NA	April 20–30	Neurologic clinic
Spain, Garcia-Basteiro ⁴	578	7.6	NA	March 28–April 9	Hospital reference, Barcelona
Denmark, Iversen ⁸	28,792	2.7	2.5–2.9	April 15–23	Capital region
France, Delmas ^a	4,607	11.5	10.6–12.4	May 14–June 17	Paris Center, university hospital

Note. CI, confidence interval.

^aPresent study.

Overall, the prevalence of IgG antibodies was 11.5% (95% confidence interval [CI], 10.6–12.4), and it was significantly higher (ie, 13%) for paramedical staff ($P = .04$). Age and gender did not differ significantly according to seroprevalence. Furthermore, 5 clinical symptoms were independently associated with positive serology: asthenia, fever, myalgia, ageusia, and anosmia, for which the highest odd ratio (OR) was observed (OR, 11.1; 95% CI, 7.4–16.6) (Table S1). Notably, although anosmia appeared to be the most specific factor, 64.3% of subjects with antibodies did not experience this symptom. The proportion of asymptomatic subjects with a positive serology was 21.4%. When considering comorbidities, positive serology was significantly associated with a lesser prevalence in smokers (OR, 0.41; 95% CI, 0.29–0.58) and a higher prevalence of diabetes (OR, 1.78; 95% CI, 1.04–3.03) (Table S1).

Discordance between RT-PCR and serology

In our study, 19.4% of the study participants had had a RT-PCR. Among individuals with negative RT-PCR, 51 of 662 (7.7%) had detectable SARS-CoV-2 antibodies, whereas 29 of 233 (12.4%) of RT-PCR-positive participants also had no detectable antibodies. The former result could be explained either by difficulties implementing RT-PCR tests or by the delay between the time of the test and the effective date of infection. For the latter finding, in addition to participants who did not develop antibodies, the time lag between PCR and serology should be mentioned (mean, 64.0 days), which implies that the serology is often realized long after the IgG peak. Indeed, the mean of antibody prevalence in this group (0.28 ± 0.32) was higher than in the negative RT-PCR group (0.05 ± 0.08 ; $P < .001$). More generally, this group with positive RT-PCR and negative antibody tests had specific characteristics: younger age (38.3 ± 12.8 vs 43.3 ± 12.4 ; $P = .04$), more likely a smoker (31.0% vs 7.4%; $P < 10^{-4}$), and male (37.9% vs 18.1%; $P = .01$) compared with those with positive RT-PCR and positive serology tests (Table S2).

Comparison with European countries

In our literature review, we retained only studies with IgG antibody testing; we excluded those with IgA or IgM serologies. The 11.5% prevalence of IgG in our HCWs is similar to the reported prevalences in Belgium or the United Kingdom (Table 1). Different protective measures, date of blood screening, and/or population structure in

each country could explain the variation in IgG serology from 1.6% reported by Korth et al² up to 14.5% reported by Bampoe et al.³ In our hospital, masks are compulsory, and protective equipment has been available since March 17.

Of the 233 HCWs participants with RT-PCR positive, 29 (12.4%) have no detectable antibodies. This result parallels that of Garcia-Basteiro et al,⁴ who also reported 15% of individuals with positive RT-PCR and negative serology. A recent study by Patel et al⁵ showed the possibility of decreased antibodies over 60 days, which implies transiently detectable antibodies.

Our study has some limitations. During the lockdown period, some HCWs were isolated at home on a case-by-case basis for reasons of severe personal or familial comorbidities. RT-PCR swab tests were conducted at the time of suspected illness only in symptomatic or in individuals who had had contact with COVID-19 patients. Thus, 902 of 4,607 (19.6%) had this test at the time of onset of symptoms.

The detection of asymptomatic cases by RT-PCR is essential to isolating or avoiding quarantine of HCWs to prevent risk of contamination for vulnerable patients and to reduce the risk of interprofessional staff-to-staff transmission.

To limit virus transmission, we emphasize the necessity of large-scale screening for exposed HCWs, even those who do not present any symptoms. Further investigations are needed to explore negative serology in subjects with positive RT-PCR for understanding population immunity and the potential risks of reinfection and disease in HCWs.

Supplementary material. To view supplementary material for this article, please visit <https://doi.org/10.1017/ice.2020.1309>

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Silver linings of the coronavirus disease 2019 (COVID-19) pandemic from an infection prevention and control perspective

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To the Editor—As a response to the evolving information about the coronavirus disease 2019 (COVID-19) pandemic, health agencies and organizations have been updating guidelines for infection prevention and control. McMullen *et al*¹ made some predictions about increasing and decreasing hospital-acquired infection rates due to the crisis care for COVID-19. Despite the numerous infection control challenges posed by severe acute respiratory coronavirus virus 2 (SARS-CoV-2) in acute-care facilities, in some ways, we have been able to identify some “silver linings” or opportunities for improved infection control practices amidst the pandemic.

Quality assurance of personal protective equipment (PPE) practices

Previous to the COVID-19 pandemic, our hospital followed the Public Health Ontario Provincial Infectious Diseases Advisory Committee's recommendations for different masks and uses, which did not delineate which ASTM mask levels were appropriate. The American Society for Testing and Materials International is a standards organization that develops and publishes consensus technical standards used in the production and testing of personal protective equipment.² Due to the global shortage of PPE supplies, we were able to vet all of our PPE stocks to assess their quality. As part of this audit, we uncovered facemasks in widespread circulation that were not ASTM rated for fluid resistance; these were subsequently removed from our clinical areas. Furthermore, as part of this detailed review of our PPE supplies, we developed standardization in ASTM mask levels appropriate for clinical areas based on the likelihood of facial fluid splash, and for most areas, an ASTM level 1 mask was

considered acceptable. This exercise would never have been conducted if the pandemic had not resulted in the development of a PPE task force to review our current inventory and our standard stocking practices.

Concerning the empowerment of staff in their PPE and choices, as part of the pandemic PPE training, all staff were instructed on the process of a point-of-care risk assessment. Despite this being a longstanding aspect of orientation for all staff, only in the pandemic has this become regular verbiage among the staff, indicating effective uptake of basic infection control principles that had previously remained aloof concepts. Similarly, a longstanding principle is that any aerosol-generating medical procedure (AGMP) requires a mask plus eye protection routinely, and a N95 respirator is also required if COVID-19 is suspected.³ Furthermore, eye protection has not been generally used within operating rooms, intensive care units (ICU), and emergency departments (EDs) across the province for multiple AGMPs, including intubations (personal communication with Chris Simpson, Queen's University). With the pandemic, however, uptake of eye protection for such scenarios has significantly improved. Similarly, environmental controls that should have been in place, including plexiglass or a physical barrier⁴ to protect staff from droplet transmission from any virus exposure when encountering unscreened patient populations were implemented. Similarly, screening for febrile respiratory tract infection is performed more systematically and is now the determinant of implementing additional precautions. In contrast, screening may not have previously been as methodical, and precautions often were initiated only if a pathogen was identified from a nasopharyngeal swab.

Increased hand hygiene compliance rates

In addition to the new systematic guidelines for PPE, we observed improved hand hygiene compliance rates during the COVID-19

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