Letter to the Editor

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Prevalence of SARS-CoV-2 antibodies in health care personnel of two acute care hospitals in Linz, Austria

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To the Editor,

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), a novel coronavirus, causes Coronavirus Disease 2019 (COVID-19). The World Health Organization declared COVID-19 to be a pandemic on March 11th 2020 and currently more than 49 million cases have been reported, leading to over 1.2 million deaths worldwide [1].

Health care personnel (HCP) are the frontline workforce for clinical care of suspected and confirmed COVID-19 cases. Therefore, HCP caring for patients with COVID-19 are exposed to the virus at a greater extent than the general population and might be considered at an elevated risk for infection. If infected with SARS-CoV-2, HCP pose a risk to vulnerable patients and fellow HCP. Consequently, understanding the prevalence of and factors associated with SARS-CoV-2 infection among frontline HCP who care for COVID-19 patients are important for protecting both

HCP and their patients. There have been several reports on prevalence of SARS-CoV-2 infection among HCP using SARS-CoV-2 RT-PCR as well as prevalence of antibodies against SARS-CoV-2 in HCP which have been summarized in a meta-analysis and a recent review [2, 3].

The aim of this prospective observational study was to investigate the seroprevalence of anti-SARS-CoV-2 in HCP of two tertiary care hospitals in Linz Austria. This work was performed at the Ordensklinikum Linz Barmherzige Schwestern and Konventhospital Barmherzige Brueder Linz, Austria. Anti-SARS-CoV-2 testing was offered to all employees of both hospitals between 15th of June 2020 and 15th of July 2020 on a voluntary basis. The study protocol was approved by the local Ethics Committee in accordance with the Declaration of Helsinki and all study participants gave written informed consent. Using Vacutainer Barricor plasma blood collection tubes (Becton Dickinson), lithium-heparin anticoagulated blood was collected and anti-SARS-CoV-2 antibodies were measured with the Elecsys Anti-SARS-CoV-2 electrochemiluminescence immunoassay (Roche Diagnostics) being a modified double-antigen Sandwich immunoassay using recombinant nucleocapsid protein [4]. Positive results were confirmed or disproved by Alinity IgG SARS-CoV-2 chemiluminescent microparticle immunoassay (Abbott Diagnostics) which is a two-step immunoassay using recombinant nucleocapsid protein. According to the manufacturer and our own evaluations both assays have a specificity of >99.5% and false positive results were only detected with one of the two assays, indicating 100% specificity when using this orthogonal testing strategy [4]. Participants were asked to fill out a structured questionnaire. Additionally, with every confirmed anti-SARS-CoV-2 positive participant a personal interview was performed to classify the transmission route (nosocomial vs. community-acquired).

Table 1 displays the baseline demographics of the two tertiary care hospitals in Linz Austria. Of the 3,479 invited HCP 1,757 (51%) gave written informed consent, filled out the questionnaire and participated in the seroprevalence

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study from 15th of June to 15th of July 2020. Among the 1,757 enrolled HCP 1,392 (79%) were female and 365 (21%) were male, the median age was 40 years (Table 2).

Overall, 36 of 1,757 (2.0%) were seropositive varying between the two hospitals ranging from 5 of 620 (0.8%) seropositive in the Konventhospital Barmherzige Brüder Linz to 31 of 1,145 (2.7%) seropositive in the Ordensklinikum Linz Barmherzige Schwestern (Table 2). Of the HCP working in a COVID-19 unit 5 of 451 (1.1%) were seropositive whereas in HCP not working in a COVID-unit 31 of 1,306 (2.4%) were seropositive. Of the 36 seropositive HCP 17 (47%) were nosocomial and 19 (53%) were community-acquired transmissions (Table 2).

Among the 17 nosocomial transmissions 13 were attributable to two small clusters in our hospitals were patients were transferred to the non COVID-19 units after initially testing negative with SARS-CoV-2 RT-PCR. Further, 2 nosocomial transmissions happened due to an initially asymptomatic HCP returning back from a skiing trip to Ischgl/Tyrol (before it became quarantined). The remaining 2 nosocomial transmission of seropositive HCP cases were rated nosocomial transmission since no clear external source of infection was found. Both have been working at different COVID-19 units always wearing appropriate personal protective equipment with repeated close contact with confirmed COVID-19 patients. For the 19 community-acquired transmissions a clear external source of transmission was evident (e.g. skiing trip, family, private contacts, school, etc.).

Among the 1,757 HCP 227 (16%) were previously tested with SARS-CoV-2 RT-PCR and 21 (1.2%) were RT-PCR positive. Of these 21 RT-PCR positive HCP, 21 (100%) were also seropositive. Of the 206 RT-PCR negative HCP 202 (98%) were seronegative. Of the 1,530 with no RT-PCR testing, 11 (0.7%) were seropositive. Overall, 15 (42%) of the 36 seropositive HCP were either negative with RT-PCR ($n=4$) or no RT-PCR has previously been performed ($n=11$) (Table 2).

To our knowledge, there is so far only one published report on the seroprevalence of anti-SARS CoV-2 in tertiary care HCP in Austria. The authors found a seroprevalence of 3.2% (2 out of 62 HCP) in an oncology department at the

Medical University of Vienna, Austria [5]. In our study we report the results of a representative sample of HCP of two acute care hospitals and we found a seroprevalence of 2.0% (36 out of 1,757 HCP). Of note, we used the same antibody assays and orthogonal testing strategy as Fuereder et al. which diminishes false positive results [5]. Compared to seroprevalence studies from other countries, were a meta-analysis revealed a median pooled seroprevalence of 7% in 27,445 HCP [2], we found rather low seropositives in the present study. In addition, another large SARS-CoV-2 serosurvey in 8,285 HCP of the Veneto region in Italy found seroprevalence of 4.6% [6].

When looking at the occupational risk of HCP to get infected with SARS-CoV-2, we found no increased seroprevalence in HCP working in a COVID-19 unit when compared with HCP not working in a COVID-19 unit. Our findings are in line with several previous studies, where no difference in seroconversion was found between HCP from COVID-19 and non-COVID-19 units [2, 7]. Although HCP, especially those caring for COVID-19 patients, are considered as a high-risk group, the seroprevalence of HCP wearing adequate personal protective equipment is thought to be not higher than other groups [8].

Interestingly, in our study almost half of the seropositive HCP were nosocomial transmissions due to undiagnosed infectious COVID-19 patients or other fellow HCP. The main reason for the nosocomial transmissions was lack of wearing the appropriate protective equipment in non COVID-19 units. Universal masking for HCP at our hospitals was implemented on the 31st of March 2020. Since then no more nosocomial infections of HCP have been reported. Similar positive effects of universal masking with significantly decreasing SARS-CoV-2 infection rates among HCP have been reported at the Mass General Brigham, the largest health care system in Massachusetts, USA [9]. In the present study, all 21 HCP that previously tested positive for SARS-CoV-2 RT-PCR also tested seropositive, indicating a very high sensitivity of the anti-SARS-CoV-2 assays used in the present study. In addition, we detected 15 additional seropositive HCP which were previously either negative or

Table 1: Demographic data of two acute care hospitals in Linz, Austria.

	Both hospitals	OKL BHS ^a	BHB ^b
Hospital beds, n (%)	947	610	337
Health care personnel (total), n (%)	3,479	2,396	1,083
COVID-19 patients (hospitalized) ^c , n (%)	85	55	30
Health care personnel (participating) ^d , n (%)	1,757/3,479 (51%)	1,145/2,396 (48%)	612/1,083 (57%)

Dichotomous data are given as absolute numbers (percent), and continuous variables are presented as median (interquartile range). ^aOKL BHS, Ordensklinikum Linz Barmherzige Schwestern. ^bBHB, Konventhospital Barmherzige Brüder Linz. ^cCOVID-19 patients treated from 15th of March – 30th of June 2020. ^dHealth care personnel participating from 15th of June – 15th of July 2020.

Table 2: Baseline characteristics and anti-SARS-CoV-2 seroprevalence of healthcare personnel of two acute care hospitals in Linz, Austria.

	Both hospitals (n=1,757)	OKL BHS ^a (n=1,145)	BHB ^b (n=612)
Sex, n (%)			
Female	1,392 (79%)	921 (80%)	471 (77%)
Male	65 (21%)	224 (20%)	141 (23%)
Age, years	40 (31–49)	41 (32–49)	38 (30–48)
Position, n (%)			
Nurse	889 (51%)	608 (53%)	281 (46%)
Assisting nurse	196 (11%)	147 (13%)	49 (8%)
Physician	339 (19%)	224 (20%)	115 (19%)
Administrative staff	147 (8%)	92 (8%)	55 (9%)
Other	186 (11%)	74 (7%)	112 (18%)
Department, n (%)			
Emergency department	97 (6%)	52 (5%)	45 (7%)
Intensive care unit	175 (10%)	122 (11%)	53 (9%)
Floor	882 (50%)	617 (54%)	265 (43%)
Operational	189 (11%)	135 (12%)	54 (9%)
Procedural	93 (5%)	42 (4%)	51 (8%)
Other	321 (18%)	177 (16%)	144 (24%)
Working in a COVID-19 unit, n (%)	451 (26%)	229 (20%)	222 (36%)
Contact with COVID-19 patients, n (%)	815 (46%)	513 (45%)	302 (49%)
Contact using proper PPE, n (%)	639 (36%)	367 (32%)	272 (44%)
Contact not using proper PPE, n (%)	176 (10%)	146 (13%)	30 (5%)
COVID-19 symptoms, n (%)	432 (25%)	287 (25%)	145 (24%)
COVID-19 RT-PCR performed, n (%)	277 (16%)	219 (19%)	58 (10%)
RT-PCR confirmed COVID-19 diagnosis, n (%)	21 (1.2%)	19 (1.7%)	2 (0.3%)
Seropositive to anti-SARS-CoV-2, n (%)	36/1,757 (2.0%)	31/1,145 (2.7%)	5/612 (0.8%)
Working in a COVID-19 unit, n (%)	5/451 (1.1%)	2/229 (0.9%)	3/222 (1.4%)
Not working in a COVID-19 unit, n (%)	31/1,306 (2.4%)	29/916 (3.2%)	2/390 (0.5%)
Nosocomial transmission, n (%)	17/1,757 (1.0%)	16/1,145 (1.4%)	1/612 (0.2%)
Community-acquired transmission, n (%)	19/1,757 (1.1%)	15/1,145 (1.3%)	4/612 (0.7%)

Dichotomous data are given as absolute numbers (percent), and continuous variables are presented as median (interquartile range). ^aOKL BHS, Ordensklinikum Linz Barmherzige Schwestern. ^bBHB, Konvenhospital Barmherzige Brüder Linz.

not tested with RT-PCR. In this context, antibody tests using appropriate testing strategies provide critical information on the transmission and spread of SARS-CoV-2 [10].

In conclusion, we report an overall seroprevalence of 2.0% in two acute care hospitals in Linz Austria. HCP working in COVID-units wearing adequate personal protective equipment did not have an increased risk of SARS-CoV-2 transmission. However, almost half of the seropositive HCP were nosocomial transmissions due to undiagnosed COVID-19 patients or other fellow HCP.

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