Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Research note

Extremely low prevalence of asymptomatic COVID-19 among healthcare workers caring for COVID-19 patients in Israeli hospitals: a cross-sectional study

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ABSTRACT

Objectives: We aimed to compare the prevalence of asymptomatic coronavirus disease 19 (COVID-19) among clinical staff in designated COVID-19 units versus that among staff in similar units with no known or suspected COVID-19 patients.

Methods: We conducted a cross-sectional survey of healthcare workers (HCWs) in eight Israeli general hospitals. The survey involved a questionnaire and a PCR test for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). We surveyed HCWs in COVID-19 units and comparison units (internal medicine and cardiology) between 30th April and 7th May 2020.

Results: There were 522 participants: 291 from COVID-19 units and 231 from comparison units. Only one participant (0.2%, 95%CI: 0.005–1.1%)—an asymptomatic nurse on a COVID-19 unit—tested positive for SARS-CoV-2. In participating COVID-19 units there were two symptomatic HCWs with confirmed COVID-19 in the 2 weeks before the survey; both were infected by contact with a co-worker outside of the COVID-19 unit.

Conclusions: The low prevalence of asymptomatic COVID-19 among HCWs, coupled with an absence of symptomatic COVID-19 acquired during patient care, suggest that Israel's national guidelines for personal protective equipment, which are consistent with those of the World Health Organization, adequately protect HCWs. **Elizabeth Temkin, Clin Microbiol Infect 2021;27:130.e1–130.e4**

Introduction

Healthcare workers (HCWs) caring for coronavirus disease 19 (COVID-19) patients are at high risk for infection when personal protective equipment (PPE) is lacking or used inconsistently [1]. In Italy, as of 19th June 2020, there were 29 174 infected HCWs comprising 12.2% of all cases of nationwide [2]. As of 23rd June 2020, the US Centers for Disease Control (CDC) had reported 84 035 cases of COVID-19 among HCWs, comprising 19.6% of all cases; the true number was likely far higher, as only 21.7% of case reports indicated HCW status [3]. As of 25th May 2020, 272 HCWs in England and Wales had died from COVID-19 [4].

In light of this high occupational morbidity, some have argued that PPE guidelines for COVID-19 are insufficient. For example, while the CDC [5] and World Health Organization (WHO) [6] consider N95 (or equivalent) masks to be adequate protection during aerosol-generating procedures, some HCWs have called for the use of powered air-purifying respirators for these and other procedures [7–9]. Inadequate protection of HCWs against infection would place not only the HCWs themselves at risk, but also their patients. A study in one London hospital determined that 15% of inpatient COVID-19 cases were definitely or probably hospital-acquired; asymptomatic staff members were considered a potential source of infection [10]. Mass testing of symptomatic and

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asymptomatic HCWs has been recommended as a means to reduce nosocomial transmission [11].

In Israel, Ministry of Health (MOH) guidelines require HCWs to wear a surgical mask as a component of PPE when caring for COVID-19 patients without severe infection, and an N95 mask when caring for COVID-19 patients with severe infection or during aerosol-generating procedures (AGPs), or when working in a designated COVID-19 unit where some patients are likely to require AGPs. Because the national policy is to cohort COVID-19 patients in designated wards and to triage possible COVID-19 patients in specialized respiratory emergency departments (EDs), most or all COVID-19 patients in general hospitals are cared for by staff using N95 masks. In addition, in order to prevent nosocomial transmission of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) from asymptomatic carriers, all other staff, patients, and visitors are required to wear a surgical mask.

We conducted a prevalence survey in which HCWs were screened for SARS-CoV-2. The state of the COVID-19 epidemic in Israel around the time of our survey was as follows: during the survey week the daily incidence of COVID-19 in Israel was low, ranging from 0.4 to 1.6 cases per 100 000 population. On the first survey day, in the eight participating hospitals there were 175 confirmed COVID-19 inpatients; 33 were mechanically ventilated. In the 2 weeks before the survey, among the participating COVID-19 units only one hospital had HCWs in isolation with confirmed symptomatic COVID-19. These were two HCWs; epidemiological investigation determined that their infection source was unprotected contact with the same co-worker outside of the patient care area (unpublished data, Israel Ministry of Health). Our aim was to compare the prevalence of asymptomatic COVID-19 among clinical staff in designated COVID-19 units versus that among staff in similar units without known or suspected COVID-19 patients.

Methods

Survey design and sample

The prevalence survey was conducted from 30th April to 7th May 2020 at eight general hospitals encompassing 5113 acute-care beds (32% of the national total). The survey involved a questionnaire and a PCR test for SARS-CoV-2. We used a convenience sample that included all HCWs in the COVID-19 units involved in patient care who volunteered to participate, and a similar number of staff in comparison units with no known or suspected COVID-19 patients (internal medicine and cardiology). We classified HCWs as working in a COVID-19 unit if they had worked at least 7 hours (i.e. nearly a full shift) in the previous 2 weeks in a COVID-19 inpatient unit or respiratory ED.

Laboratory methods

Swabs were obtained for PCR testing according to each participating hospital's protocol; one hospital took nasopharyngeal swabs, six took nasopharyngeal and oropharyngeal swabs, and one took mid-turbinate nasal and oropharyngeal swabs. The microbiology laboratory in each hospital processed its own tests.

Statistical methods

To compare characteristics of HCWs in COVID-19 units versus comparison units, we used a χ^2 or Fisher's exact test, or t-test. Analyses were done using Stata 14.2 (StataCorp, College Station, TX, USA).

Ethics

All participants volunteered for the survey and consented in writing. Publication of the results was approved by the jurisdictional institutional review board.

Results

There were 522 participants in our survey: 291 from COVID-19 units and 231 from comparison units. In the 2 weeks prior to being tested, these HCWs provided a total of 18 097 hours of COVID-19 patient care: 18 058 hours of care by the COVID-19 group (a median of 64 hours per HCW; interquartile range: 32–80) and 39 hours by the comparison group. Participants' characteristics are summarized in Table 1. All but two HCWs caring for COVID-19 patients reported always using full PPE that included gloves, waterproof gown, face shield, and N95 mask.

Only one participant (0.2%, 95%CI: 0.005–1.1%) tested positive for SARS-CoV-2 on the day of the survey; this was an asymptomatic nurse on a COVID-19 unit. An epidemiological investigation was unable to pinpoint the source. The difference in prevalence between COVID-19 units and comparison units was 0.3% (95%CI: −0.3 to 1.0%).

Discussion

In a cross-sectional survey of 522 HCWs, we found a low prevalence of COVID-19. This was true both for HCWs providing patient care in COVID-19 units and those working in comparison units who might have been exposed to undiagnosed COVID-19 patients. In addition to the one asymptomatic infected HCW detected in this survey, in the 2 weeks before the survey two symptomatic infected HCWs were detected in participating COVID-19 units; their infections were attributed to contact with an infected co-worker. The combined findings of no symptomatic infections acquired during patient care and one asymptomatic infection among extensively exposed HCWs provide evidence supporting the effectiveness of the Israeli national PPE policy, which consists of full PPE including an N95 mask when working in COVID-19 inpatient wards where AGPs are performed, and universal surgical masks in other hospital locations. Cohorting COVID-19 patients in designated wards achieves three goals: limiting patient-to-patient transmission, simplifying HCWs' decision-making surrounding PPE use, and preserving the limited supply of PPE.

Two findings from the questionnaire warrant intervention: 7.5% of HCWs (39/518) who reported symptoms that could indicate COVID-19 and 1.7% of HCWs (9/515) who reported recent contact with a confirmed COVID-19 case still went to work. MOH guidelines require HCWs to stay at home in both situations. Hospital management must better communicate to its employees the risks they are posing to patients and colleagues by presenteeism.

A limitation of our study is that PCR testing gives a snapshot of HCW COVID-19 status only on the day of testing; the prevalence of asymptomatic infection may have been higher at other points in the pandemic. A second limitation is that the questionnaire was not anonymous, creating the possibility of social desirability bias when reporting compliance with prevention measures.

In summary, our findings of a low prevalence of asymptomatic COVID-19 among HCWs, coupled with an absence of symptomatic COVID-19 acquired during patient care, suggest that Israel's national guidelines for personal protective equipment, which are consistent with those of the WHO [6], adequately protect HCWs from infection with SARS-CoV-2.

Table 1
Characteristics of healthcare workers in COVID-19 units or comparison units (internal medicine and cardiology). Denominators are listed if responses were missing

	Worked in COVID-19 unit or respiratory ED for ≥7 hours in previous 2 weeks		p
	Yes	No	
	$n = 291$	$n = 231$	
Demographic/professional characteristics:			
Age, mean (SD)	38.3 (10.2)	40.0 (12.2)	0.10
Male sex	111 (38.1%)	77 (33.3%)	0.26
Profession			0.32
Physician	109 (37.5%)	89/230 (38.7%)	
Nurse	132 (45.4%)	91/230 (39.6%)	
Nurse's aide	24 (8.3%)	19/230 (8.3%)	
Other	26 (8.9%)	31/230 (13.5%)	
Risk factors for SARS-CoV-2 exposure at work:			
Total person-hours in COVID-19 unit or respiratory ED in past 2 weeks	18,058	39	
Received training on use of PPE	287/290 (99.0%)	216/230 (93.9%)	<0.01
Full PPE for routine care (not aerosol-generating procedures) of COVID-19 patients			1.0
Always—N95 mask	281/283 (99.3%)	8/8 (100%)	
Always—surgical mask	2/283 (0.07%)	0	
Mask use in staff room in previous 2 weeks			0.10
Always	176/281 (62.6%)	120/218 (55.1%)	
Most or some of the time	101/281 (35.9%)	90/218 (41.3%)	
Rarely or never	4/281 (1.4%)	8/218 (3.7%)	
Meals with colleagues <2 meters apart in previous 2 weeks			
Always	38/283 (13.4%)	17/216 (7.9%)	0.13
Most or some of the time	91/283 (32.2%)	70/216 (32.4%)	
Rarely or never	154/283 (54.4%)	129/216 (59.7%)	
Risk factors for SARS-CoV-2 exposure outside of work:			
Attended event with >50 people since 15th Feb 2020	54/284 (19.0%)	45/227 (19.8%)	0.82
Attended meeting or event with people other than household member in previous 2 weeks	53/284 (18.7%)	66/227 (29.1%)	<0.01
Contact with confirmed COVID-19 case in previous 2 weeks	6/287 (2.1%)	3/228 (1.3%)	0.74
Household member in quarantine in previous 2 weeks	4/287 (1.4%)	1/229 (0.4%)	0.39
Mask use in public			0.57
Always	236/283 (83.4%)	181/227 (79.7%)	
Usually	39/283 (13.8%)	38/227 (16.7%)	
Sometimes or never	8/283 (2.8%)	8/227 (3.5%)	
Previously tested for SARS-CoV-2	120/288 (41.7%)	73/226 (32.3%)	0.03
Symptoms on survey day[a]	20/290 (6.9%)	19/228 (8.3%)	0.54

ED, emergency department; SD, standard deviation; PPE, personal protective equipment.
[a] Symptoms: fever, cough, shortness of breath, sore throat, loss of taste or smell, nausea, vomiting, or diarrhea.

Author contributions

Elizabeth Temkin and Mitchell J. Schwaber contributed equally to this work. ET, MJS, and YC conceived of and designed the study, analysed the results, and wrote the manuscript. All other authors conducted the study and collected data, revised the manuscript, and approved the final version.

Transparency declaration

All authors declare no conflicts of interest. No funding was received for this work.

Appendix

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