



## COVID-19 infection among healthcare workers in a national healthcare system: The Qatar experience



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### ABSTRACT

**Background:** Our aim was to determine the prevalence of COVID-19 infection in healthcare workers (HCWs) in a national healthcare system and to understand the risk factors for infection.

**Methods:** The study was conducted at Hamad Medical Corporation (HMC) in Qatar, a national healthcare system with 14 hospitals and >28,000 employees, between March 10 and June 24, 2020. Data on COVID-19+ HCWs were retrieved from the electronic health records and employment records, followed by an email survey and a focused telephone interview.

**Results:** Among 16,912 HCWs tested, 10.6% tested positive. Hospitalization rate was 11.6%, 1.3% required supplemental oxygen, 0.6% needed intensive care unit admission, and 0.3% required mechanical ventilation. There were no deaths. In a follow-up survey of 393 HCWs, 5% reported acquiring infection at a COVID-19-designated facility and 95% at a non-COVID-19 facility having acquired the infection through accidental exposure to a colleague (45%) or a patient (29%). Full personal protective equipment (PPE) adherence was 82% at COVID-19-designated facilities but only 68% at non-COVID-19 facilities.

**Conclusions:** COVID-19 infection among HCWs often occurs among those not directly working with COVID-19 patients. PPE use is less stringent in such settings. Risk of exposure and need for strict PPE must be stressed upon all HCWs in all settings.

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### Introduction

Since the identification of first case cluster in Wuhan, China, in December 2019, the COVID-19 pandemic has swept the entire world. The pandemic has overwhelmed hospital capacity and existing healthcare resources in many countries. Healthcare workers (HCWs) are a particularly high-risk group due to their close interactions with infected persons as well as lack or deficiency of personal protective equipment (PPE) in many settings. The rate of infection in HCWs is reported to vary between 3 and 17% and varies according to the history and degree of exposure and presence of symptoms (Lan et al., 2020; Fusco et al., 2020; El-Boghdady et al., 2020; Chen et al., 2020). It is important to understand the prevalence and risk factors for COVID-19

infection among HCWs due to the potential to transmit infection to vulnerable patients, and since a further depletion of the workforce due to infection among the HCWs can lead to critical shortages and adversely impact patient care. Our aim was to determine the prevalence of COVID-19 infection in HCWs in a national healthcare system and to understand the risk factors for infection.

### Methods

The study was conducted at Hamad Medical Corporation (HMC) in Qatar between March 10, 2020 and June 24, 2020. HMC is the public healthcare delivery organization providing approximately 85% of the acute care inpatient bed capacity in the State of Qatar. There are 14 hospitals in the organization with a total employed staff of more than 28,000 persons. All hospitals are accredited by the Joint Commission International and the central lab is accredited by the College of American Pathologists. There is a single electronic health record system (Cerner, Kansas City, USA) across all facilities, and patients and staff retain the same unique hospital identification number across the system.

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The first case of COVID-19 in Qatar was identified on February 28, 2020 in a returning traveler. However, screening of potential high-risk and symptomatic persons had begun in early February. Testing capacity in Qatar was ramped up rapidly and currently Qatar ranks among the countries with highest per capita testing in the world. Screening of HCWs began in mid-February 2020, with initial screening performed on symptomatic HCWs and those with a history of any contact with a confirmed or suspected case. Testing for COVID-19 was performed using a deep nasopharyngeal and a concomitant throat swab by trained professionals. Validated RT-PCR was performed at a single national reference lab to confirm infection. Beginning in April 2020, all HCWs in intensive care units and emergency departments were required to undergo point-of-care testing using commercial antibody kits (company name) every two weeks. Those testing positive for IgM provided a nasopharyngeal and throat swab for RT PCR testing.

All HCWs at any of the HMC facilities with a RT PCR positive for COVID-19 on a nasopharyngeal swab were eligible to be included in this study. We retrieved demographic and employment-related information from the electronic health records and employment records in the Human Resources department. Trained infection control practitioners at each facility approached all positive HCWs through email and follow-up telephone calls to gather data regarding exposure history, use of PPE and presence of symptoms. The WHO COVID-19 staff exposure risk assessment tool was used as a template to gather data. In addition, we used a checklist of symptoms developed for triage of suspected patients to ascertain the presence of symptoms. An open-ended question was also included to elicit any other symptoms not listed in the checklist. Hospitalization data, including admitting unit and need for supplemental oxygen, were extracted from the electronic health records.

The study was approved by the Institutional Review Board of Hamad Medical Corporation with a waiver of informed consent under a pandemic response framework adopted by the institution.

## Results

A total of 16,912 staff members were tested for SARS-CoV-2 between March 10 and June 24, 2020 with 1799 (10.6%) testing positive. The median age (IQR) was 39 (33,48) years and 65.6% were male. The most common nationalities affected were Indian (50.8%), Filipino (14.0%), Qatari 6.1%, and Egyptian (5.6%), reflecting the overall demographic profile of the HMC employees. At least one national from 27 additional countries was infected collectively amounting to 8.2% of the infected HCWs. (Table 1) Nurses and midwives had the highest number of infections (33.2% of all infected HCWs) followed by non-clinical support service staff (31.3%), administrative staff (14.6%), allied health professionals (12.7%), physicians (5.2%), and other clinical support staff (2.9%).

A total of 671 infected HCWs were surveyed by the infection prevention and control team immediately after the positive COVID-19 test was reported. Demographics of these groups were similar to the overall group. The most common reasons for testing were random screening (28.2%), screening as a part of contact tracing (18.0%) or presence of symptoms suggestive of COVID-19 infection (16.7%). Exposure to a family member or roommate with confirmed infection each was reported by 9.5%. Two-thirds of the infected HCWs were symptomatic with fever (34.6%), cough (32.2%), and sore throat (15.8%) being the most commonly reported symptoms. Among all infected HCWs, 278 (15.4%) were hospitalized. Among the survey respondents, 78 (11.6%) were hospitalized, 9 (1.3%) required supplemental oxygen, 4 (0.6%) were admitted to the intensive care unit, and 2 (0.3%) required mechanical ventilation. There were no deaths.

Early in the pandemic preparedness phase, Qatar had designated certain hospital and healthcare facilities to be non-COVID-19 facilities, with the intention of cohorting COVID-19 patients at specific designated facilities for efficiency, optimal utilization of resources, and improved infection prevention. To understand the transmission dynamics and impact of facility designation as COVID-19 or non-COVID-19 facility, we conducted a focused follow-up telephone survey on 393 COVID-19 positive HCWs 1–6 weeks after diagnosis. Only 5% of respondents reported acquiring the virus from working at a COVID-19-designated facility while the remaining 95% reported working at a non-COVID-19 facility and acquired the infection from accidental exposure to a colleague (45%) or to a patient (29%). Among infected HCWs at COVID-19-designated facilities, 82% reported used full PPE at all times while 68% of infected HCWs at non-COVID-19 facilities reported using PPE as directed.

## Discussion

Protection of HCWs from infection is critical for resilience of the health system facing a major pandemic like COVID-19. However, despite all efforts to protect HCWs, some exposure is inevitable. Such exposure can occur at the workplace or outside the work environment in the community.

To reduce workplace exposure, increase efficiency, and pooling of resources, Qatar decided to designate certain facilities to be non-COVID-19 facilities before the pandemic hit the country. It was therefore anticipated that HCWs working at non-COVID-19 facilities would be at a very low risk for infection acquired at the workplace. It was therefore surprising that 95% of the infected HCWs were assigned to a non-COVID-19 facility and 72% of these reported exposure to a coworker or patient as the source of infection. Possible reasons for this include a lower rate of adherence to prescribed PPE at non-COVID-19 facilities, complacency with strict infection prevention precautions, and unrecognized infection among patients and coworkers. Conversely, at COVID-19-designated facilities, HCWs may have been more adherent to PPE use and infection prevention measures since most, if not all patients in these facilities, were known to be COVID-19 infected.

Our findings underscore the need for strict PPE use and infection control measures regardless of workplace environment and whether any patients or coworkers are known to be COVID-19 infected. This is critical to reduce infection rates among HCWs and to ensure reliable availability of the workforce in times of critical need like the current COVID-19 pandemic.

## Disclaimer

The views presented in this manuscript are those of the authors and do not necessarily represent the views or official policy of Hamad Medical Corporation or the Ministry of Public Health, Qatar.

## Author contributions

Study design: JA; AAB; AA.

Data acquisition: JA; AA; JCA.

Data analysis: AAB; AA.

Manuscript writing: AAB; AA.

Critical review and major scientific input: JA; AMJ; JCA; MI; EGC; AAB; AA.

## Conflict of interest

The authors have no conflict of interest to declare.

**Table 1**  
Baseline characteristics.

	All infected N = 1,799		Survey respondents N = 671	
Median age (IQR), years	39 (33,48)		39 (33,46.5)	
Male sex	1180	65.6%	417	62.1%
Nationality				
Indian	914	50.8%	373	55.6%
Filipino	252	14.0%	83	12.4%
Qatari	109	6.1%	17	2.5%
Egyptian	100	5.6%	41	6.1%
Jordanian	55	3.1%	22	3.3%
Sudanese	52	2.9%	22	3.3%
Bangladeshi	51	2.8%	24	3.6%
Pakistani	50	2.8%	16	2.4%
Nepalese	37	2.1%	16	2.4%
Palestinian	32	1.8%	7	1.0%
Others	147	8.2%	50	7.5%
Job category				
Nursing and Midwifery	597	33.2%	292	43.5%
Non-clinical Support Services	563	31.3%	186	27.7%
Administration	263	14.6%	37	5.5%
Allied Health Professionals	229	12.7%	100	14.9%
Physicians	93	5.2%	37	5.5%
Clinical Support	53	2.9%	19	2.8%
Reason for testing				
Screening–random			189	28.2%
Screening–contact tracing			121	18.0%
Screening–symptomatic			112	16.7%
Family member with confirmed infection			64	9.5%
Roommate with confirmed infection			64	9.5%
Patient with confirmed infection			48	7.2%
Colleague with confirmed infection			41	6.1%
Screening–high risk staff			22	3.3%
Unknown			7	1.0%
Travel			3	0.4%
Comorbidities				
At least 1 comorbidity			149	22.2%
Pregnancy			13	1.9%
Hypertension			62	9.2%
Diabetes			64	9.5%
Cardiac disease			10	1.5%
Respiratory disease			17	2.5%
Other			49	7.3%
Symptoms				
At least one symptom			453	67.5%
Fever			232	34.6%
Cough			216	32.2%
Sore throat			106	15.8%
Shortness of breath			25	3.7%
Gastrointestinal (nausea, vomiting, diarrhea)			23	3.4%
Rhinorrhea			21	3.1%
Other			64	9.5%
Severity of illness				
Admitted to acute care bed	278	15.4%	78	11.6%
Required supplemental oxygen			9	1.3%
Admitted to intensive care			4	0.6%
Required mechanical ventilation			2	0.3%

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**Ethical approval**

The study was approved by the Institutional Review Board of Hamad Medical Corporation with a waiver of informed consent under a pandemic response framework adopted by the institution.

**CRedit authorship contribution statement**

**Jameela Alajmi:** Conceptualization, Data curation, Investigation, Writing - review & editing. **Andrew M. Jeremijenko:** Investigation, Writing - review & editing. **Joji C. Abraham:** Data curation, Investigation, Writing - review & editing. **Moza Alishaq:** Investigation, Writing - review & editing. **Elli Gabriel Concepcion:** Investigation, Writing - review & editing. **Adeel Ajwad Butt:** Conceptualization, Formal analysis, Investigation, Writing -

original draft, Writing - review & editing. **Abdul-Badi Abou-Samra**: Conceptualization, Data curation, Formal analysis, Investigation, Writing - review & editing.

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