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Brief Communication

Prevalence of COVID-19 Antibodies in Healthcare Workers at the Peak of the Pandemic in Mumbai, India: A Preliminary Study

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Abstract

Healthcare worker (HCW) infections due to COVID-19 are of serious consequence. Testing for antibodies against COVID-19 in HCWs has been previously recommended. We conducted a serosurvey in HCWs at a private hospital in Mumbai which is treating COVID patients. A total of 244 HCWs were tested. The prevalence of infection in asymptomatic HCWs was 4.3% and in previously symptomatic untested HCWs was 70%. We recommend that HCWs with a previous history of COVID symptoms who were not tested/tested negative by reverse transcription–polymerase chain reaction should be tested for antibodies at least 2 weeks after onset of symptoms.

Keywords: Antibodies, asymptomatic, COVID-19, healthcare workers, India

Introduction

Healthcare worker (HCW) infections with COVID-19 are associated with morbidity, mental stress, disruption of patient care, risk of transmission to patients and family members and even mortality.[1] Therefore, protection of HCWs from COVID-19 and early diagnosis/isolation/treatment is a worldwide priority.[2] While reverse transcription–polymerase chain reaction (RT-PCR) is the gold standard for diagnosis, infections may not be reported/tested or tests may be negative. Here, serologic tests may prove useful. In addition, estimation of COVID-19 antibodies in HCWs has been recommended by the Indian Council of Medical Research and other health agencies to study the epidemiology of the disease, effectiveness of infection control measures and identify candidates for donation of convalescent plasma.[3,4] At the same time, the sensitivity, specificity and positive and negative predictive values of antibody detection tests are variable.[5] The study site has been treating COVID-19 patients since March 2020 and has in place protocols for infection control and diagnosis/treatment/isolation of infected HCWs in accordance with national guidelines.[6] This preliminary study was conducted to assess the prevalence of antibodies to COVID-19 in HCWs in the month of June 2020.

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Methods

The study was conducted on serum samples from HCWs (1) who either had mild symptoms compatible with COVID-19 in the past and who were not tested for COVID-19 and (2) asymptomatic HCWs (consultants, junior medical doctors, nurses, laboratory technicians, security staff, porters, healthcare assistants, housekeeping and physiotherapists) working in the COVID and non-COVID areas of the hospital. Serum samples from HCWs with a history of symptomatic RT-PCR-confirmed COVID-19 infection and asymptomatic senior management staff were used as positive and negative controls, respectively. After verbal consent, the HCWs were required to fill in a form that detailed their department, history of exposure to COVID patients, history of COVID-like symptoms and history of a positive COVID test if any. The detection of

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antibodies to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was done initially using chemiluminescent microparticle immunoassay on Architect, Abbott, USA, and later in the study by electrochemiluminescence immunoassay on Elecsys®, Roche, Switzerland. The sensitivity and specificity of these tests have been previously reported to be 74% and 100% (Abbott) and 100% and 99% (Roche).[7,8] A subset of HCWs who tested positive/negative by the first kit were retested by the second kit to assess inter-kit agreement. The results were communicated to the tested HCWs with explanation about the implications of a positive or negative result.

Results

The staff strength of the 750-bed hospital is 2500. The hospital has admitted about 400 patients with confirmed COVID-19 till the date of submitting the data. A total of 244 HCWs (10% of the staff) were tested (76 with the Abbott kit and 168 with the Roche kit). The results of the testing are displayed in Table 1. None of the HCWs at low risk of infection (negative controls) tested positive. Twenty-one (91%) of the 23 HCWs with a previous history of RT-PCR-confirmed COVID-19 infection (positive controls) tested positive. Seventy per cent of HCWs with previous COVID-like symptoms tested positive, whereas only 4.3% of asymptomatic HCWs tested positive. None of these asymptomatic HCWs who tested positive were working in COVID areas of the hospital and included two administrative staff, three nurses, two dialysis technicians and one healthcare assistant. Twenty HCWs who tested positive (10) and negative (10) with the first kit were retested with the second kit with identical results. No correlation of the readings of the tests with the severity of symptoms was seen.

Discussion

Both antibody tests demonstrated good sensitivity in diagnosing previously PCR-confirmed symptomatic cases after 2 weeks of onset of symptoms in our setting. The specificity seemed to be good too as none of the low-risk HCWs tested positive. The prevalence of infection was 4.3% in asymptomatic HCW. The prevalence of positive serology in asymptomatic HCWs has been reported as 0% in Wuhan, China, to 2% in one hospital in Germany.[9,10] Similar to us, previous studies have reported none/infrequent infection in the HCWs directly involved in the care of COVID patients.[10] This can possibly be attributed to better personal protective equipment (PPE) and heightened caution of HCWs in COVID areas.

Table 1: Results of the serosurvey at the study hospital

Category	Number tested	Number positive (%)
Negative controls	13	0 (0)
Asymptomatic and working in clinical areas	182	8 (4.3)
Mildly symptomatic but RT-PCR not done	26	18 (70)
Positive controls	23	21 (91)

RT-PCR: Reverse transcription–polymerase chain reaction

Similar to our study, previous studies also report higher positivity rates in HCWs with symptoms as compared to asymptomatic HCW.[11] Therefore, testing of symptomatic HCWs is likely to yield higher returns as compared to asymptomatic HCW. The positive predictive value (PPV) of the test in symptomatic HCWs will be higher than in an asymptomatic HCW. Another way to improve the PPV is retesting a positive individual with another antibody test.[4] In our study, a subset of ten patients who tested positive with the first kit tested positive with the second kit confirming high specificity.

The accuracy of antibody tests in COVID-19 has been debated.[12] Various kits differ from each other, and local validation of the kits is recommended.[4] It is also known that the magnitude of the antibody response depends on the severity of infection; patients with asymptomatic infections/mild infections may not mount a measurable antibody response.[5] Hence, these antibody tests can underestimate the infection rate in those tested. Conversely, cross-reactivity with other coronaviruses may lead to false-positive results.[4]

The other important question is whether HCWs with previous infection or measurable antibodies are immune to reinfections and hence be deployed in high-risk areas. There is mounting evidence from animal studies that previous infection with COVID-19 protects against reinfection.[13] However, questions relating to the longevity of the immune response, the level of antibodies needed for protection and the correlation between binding antibodies (measured by commercial tests) and neutralising antibodies that afford protection remain unanswered.[4] Besides, anecdotal cases of relapse/reinfection of SARS-CoV-2 have also been described.[14]

The small sample size and absence of a systematic random sampling method are limitations of the study. Larger serosurveys in HCWs and comparing them to the general population will help in further defining the epidemiology of the illness. At the same time, the presence of antibodies in HCWs should not be equated with immunity and allow the lowering of PPE or infection control precautions.[15]

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Conflicts of interest

There are no conflicts of interest.

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