Introduction

Health care workers (HCW) have greater exposure to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and have a higher risk of Corona Virus Disease (COVID-19). Many COVID-19 patients remain asymptomatic or mildly symptomatic, so prevalence estimates based on PCR-positive cases alone can underestimate the true prevalence. IgG antibodies to SARS-CoV-2 generally become detectable beginning 10 – 14 days following infection but may occur later. Knowing the seroprevalence of SARS-CoV-2 antibodies among HCWs is important to understand COVID-19 spread among health care facilities.

Objectives

To estimate the seroprevalence of SARS-CoV-2 antibodies among HCWs, and to study the factors associated with this seroprevalence.

Material and Methods

Study design and settings: Cross-sectional study of HCWs from a Dedicated COVID Hospital (DCH).

Study period: December 2020-February 2021

Sampling: Universal sampling for qualitative testing and the samples which tested positive were subjected to quantitative analysis (Serial testing).

Inclusion criteria: Doctors, nurses, security staff, and other staff working in this DCH were considered as HCWs and were included in the study. HCWs working for more than 14 days in this DCH and who gave voluntary informed consent were included.

Exclusion criteria: HCWs who were pregnant or lactating at the time of study were excluded.

Study procedure: Participants had undergone phlebotomy for serum collection and answered the survey questions. Initially, qualitative test of antibodies was done using COVID-19 IgG rapid test device by Voxpress approved by ICMR. The kit used the lateral flow immune-chromatography technique and has a sensitivity of 94% and specificity of 100%. The samples which tested positive were subjected to a quantitative test. For quantitative test the iFlash-SARS-CoV-2 IgG assay, a paramagnetic particle chemiluminescent immunoassay (CLIA) having a sensitivity of 97.3% and specificity of 96.3% was used. Only when both tests were positive the individual was considered as positive (series testing).

Statistical analysis: Data entry was done by using Microsoft Excel version 2010 and statistical analysis was done using IBM SPSS Statistics for windows, version 22. Chisquare test, Fischer’s Exact test, T Test and ANOVA test were used.

Results

A total of 1005 HCWs were tested out of which 124(12.3%) tested positive by qualitative test for IgG antibodies against SARS-CoV-2. Out of these 124 security staff, and other staff working in this DCH were considered as HCWs and were included in the study. HCWs working for more than 14 days in this DCH and who gave voluntary informed consent were included.

Conclusion: Good infection prevention practices can keep the infection rate in HCWs low. HCWs with mild symptoms should also be tested and asymptomatic HCWs should be screened periodically to decrease the spread of COVID-19.
samples, 101(81.45%) tested positive by quantitative ELISA test. Both the tests were positive in 101(10%) of HCWs and they were considered as positive by series testing. Out of the 1005 HCWs, 155(15.4%) were doctors, 496 (49.4%) were nurses, 151(15%) were Patient Care Attendants (PCAs) and Housekeeping staff, 38 (3.8%) were Phlebotomists and Technicians, 165 (16.4%) had other designations like security staff, clerk. Most 762(75.8%) of the HCWs were young (18 to 30 years). There was statistically no significant difference between the seropositivity of HCWs with regards to the designation, age, place of work, duration of work in this DCH, Comorbidities, think(believing that they) have antibodies against COVID-19, prophylaxis for COVID 19. Most HCWs received training in Infection prevention and control (IPC) 988(98.3%), used personal protective equipment(PPE) whenever indicated 997(99.2%), performed hand hygiene before and after handling patients or their material 981(97.6%). None of the HCW had taken the COVID-19 vaccine in this study.

The seroprevalence in male HCWs 43(13.9%) was more than that of female HCWs 58(8.3%) and the difference was statistically significant. Out of 1005 HCWs, 116(11.5%) had a history of prior COVID-19. The seroprevalence in HCWs with a history of suffering from COVID-19 disease 27(23.3%) was more than the seroprevalence in HCWs not having this history 74(8.3%) and the difference was statistically significant. The seroprevalence in HCWs with lesser education was more than those with higher education and the difference was statistically significant.

Totally 190(19%) HCWs had taken Hydroxychloroquine, 98(9.8%) had taken Vitamin C, 69(6.9%) had taken Zinc and 72(7.2%) had taken B complex for prophylaxis. Out of the 295 HCWs who had taken prophylaxis 233(79%) had taken it for less than 1 month, 44 (14.9%) had taken it for less than 2 months, 12 (4.1%) had taken it for 4-6 months, 6(2%) had taken it for 7-9 months. Totally 80(51.6%) doctors, 182(36.7%) Nurses, 33(9.3%) other employees had taken prophylaxis.

As shown in Table 2, out of the 116 HCWs who had a history of COVID-19, 10 were home quarantined and none of them were positive for IgG antibodies, while 6(50%) of those hospitalized for 21-30 days were positive for IgG antibodies and the difference was just significant.

As shown in Table 3 out of the 116 HCWs who had history of...
COVID-19, 30 were positive in the qualitative antibody test. Of these 30 HCWs, 3 had negative titer (<10) in the quantitative test. The mean titer decreased as duration after COVID positivity increased but the reduction was not significant.

**Discussion**

The seroprevalence in healthcare workers was 10% indicating the previous infection. In another seroprevalence study among HCWs in Mumbai the seroprevalence was similar i.e.11%. In the third round of the Indian Council of Medical Research’s National Serological Survey the seroprevalence was 21.4% in the general adult population and 25.7% in healthcare workers. The difference can be due to the differences in testing methods, study populations, etc.

There was no significant difference in seroprevalence between different categories of healthcare workers. The risk of infection in doctors and nurses is not raised probably due to good IPC activities like universal training of HCWs in IPC, proper use of PPEs, hand hygiene before and after handling patients or their material. A study in the USA and a review article had similar findings. Also place of work, duration of work did not affect seroprevalence, probably due to good IPC activities. Infection can also be acquired by HCWs when they are not caring for patients for example during meals, at home, during travel, markets, where adequate masks, social distancing, hygiene may not be followed. HCWs having higher education were having lesser seroprevalence as they were more likely to follow better infection prevention practices both inside and outside the workplace. In our study males had more seroprevalence and seroprevalence did not differ significantly with age or comorbidities. Another study in Mumbai had similar findings.

Among healthcare workers, without a history of suffering from COVID-19, the seroprevalence was 8.3%. These HCWs might be in contact with other HCWs, patients during their infective period and spreading the disease. There were similar findings in another study in Mumbai. The asymptomatic and mildly symptomatic can contribute significantly to the spread of infection so they need to be tested and isolated. The seroprevalence in HCWs with a history of suffering from COVID-19 disease (23.3%) was significantly more than the seroprevalence in HCWs not having this history (8.3%). There were similar findings in another study.

In our study the mean interval between COVID 19 and sample collection was less in those with IgG positive than those with IgG negative, also the mean IgG titer was more when this interval was less but the difference was not significant. A study in HCWs in Mumbai had similar findings.

We have used the testing in series approach which improved specificity but sensitivity may be decreased.

**Conclusion**

Good infection prevention practices can keep the infection rate in HCWs low. HCWs with mild symptoms should also be tested and asymptomatic HCWs should be screened periodically to decrease the spread of COVID-19.

**Acknowledgment**

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**References**

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