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# Prevalence of SARS Cov-2 Antibodies among Healthcare Workers in a Tertiary Care Hospital of Gurugram, Haryana

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**KEYWORDS**

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**ABSTRACT:**

Healthcare workers play an key role in combating the current pandemic. Despite the potential risk of acquiring COVID-19 infection, they stand at the frontline and work throughout this great pandemic. Thus, it is important to conduct antibody testing to understand the seroprevalence of SARS-CoV-2 and potential immunity to HCWs. The present study enrolled 551 HCWs for SARS-CoV-2 antibody survey with the aim to determine the prevalence of antibodies against SARS-CoV-2 and correlation with occupational category among HCWs. The overall SARS-CoV-2 positive serology among the HCWs was 6.9% with higher rates positive for IgM (44.7%) compared to IgG (28.9%) and total antibody (IgM + IgG) (26.3%). Serology for detection of SARS-CoV-2 antibodies is recommended for HCWs as this could reveal the actual burden of previous exposure to the virus, exploring the unnoticed infections also.

## Introduction

Coronavirus disease 2019 (COVID-19) caused by Severe acute respiratory syndrome Coronavirus-2 (SARS-CoV-2), first reported from Wuhan, China in December 2019 emerged as a pandemic resulting in significant public health challenges with high morbidity and mortality [1]. It has affected 572,239,451 individuals with 6,390,401 deaths globally as of 29$^{th}$ August 2022 [2]. Health care workers (HCWs) are most vulnerable to SARS-CoV-2 infection during patient examination, invasive procedures and due to close proximity with patients [3]. Despite these potential risk of acquiring COVID-19 infection, they stood at the frontline and work throughout this great pandemic. The World Health Organization (WHO) estimates that 80 000 to 180 000 HCWs have lost their lives due to COVID-19 in the period between January 2020 to May 2021 [4].

A COVID-19 infected HCW can expose their families, patients or his/ her fellow colleagues to unprecedented levels of risk. Thus, it is important to conduct antibody testing to understand the seroprevalence of SARS-CoV-2 and potential immunity to HCWs. Various studies from different parts of the world have reported SARS-CoV-2 seroprevalence among HCWs between 0.8% to 31.2% [5-12]. Evidently, many of these studies reported seropositivity among asymptomatic individuals between 38% to 48% [10-12]. Therefore, the present study was conducted to determine the prevalence of antibodies against SARS-CoV-2 and correlation with occupational category among HCWs.

## Materials and Methods

### Study population

The present study was a cross-sectional study conducted in a COVID-19 referral hospital over a period of 8 weeks**,** beginning on 07 July, 2020. We enrolled 551 HCWs including doctors, dentists, physiotherapists, nurses, laboratory and operation theatre technicians and multipurpose HCWs who agreed to participate and gave signed consent. The study protocol was approved by the institutional ethical committee.

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**Study procedures**

After recruiting the participants, detailed questionnaire was filled, which included demographic, clinical (respiratory symptom in past six months), co-morbidities and nature of exposure/ contact with COVID-19 patients.

**COVID-19 serologic assay**

Approximately 3 ml of venous blood sample were collected from all the study participants. These biospecimens were subjected to rapid immunochromatography test using Standard Q COVID-19 IgM/IgG Combo kits, SD Biosensor for qualitative presumptive detection of SARS-CoV-2 IgM and IgG antibodies.

**Statistical analysis**

Data collected were entered into Microsoft Excel and analysed using Stata Version 12.0. Categorical variables were expressed as frequency and percentage of study participants.

**Result**

A total of 551 healthcare workers, categorized based on their occupation were included in the study. The mean age of the HCWs was 32.6± 8.7 years, were mostly males (297, 53.9%). Out of the 551 HCWs, majority of them were doctors (23.8%, n= 131), followed by nurses (23.4%, n=129) and multipurpose HCWs (20.1%, n= 111) while rest comprised of dentists, physiotherapists, laboratory and operation theatre technicians (Fig. 1).

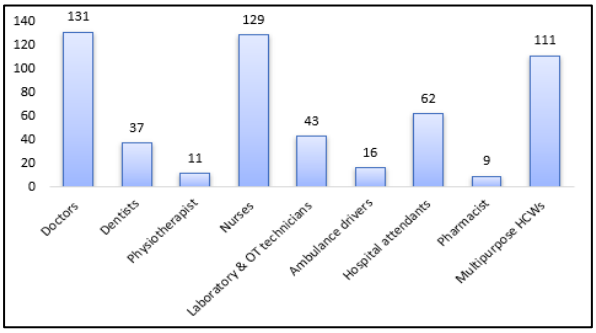


**Figure 1. Distribution of healthcare workers according to their job profile**

The overall SARS-CoV-2 positive serology among the HCWs was 6.9% (n=38) with higher rates of positivity for IgM (44.7%, n=17) compared to IgG (28.9%, n= 11) and total antibody (IgM + IgG) (26.3%, n=10). Majority of the individuals were males (68.4%, n=26) compared to females (31.6% n=12). Among the participants in 18-40 year subgroup, 0.9%, 2.8% and 2.4% tested positive for total antibody (IgM + IgG), IgM and IgG respectively while in the 41-60 year subgroup, 5.9% and 4.7% tested positive for total antibody and IgM respectively. In the >60 year subgroup, one out of seven participants tested positive for total antibody (Table 1). Of the 38 HCWs, the positive serology was higher among doctors, 39.5% (n=15/131); followed by ambulance drivers, 12.5% (n=2/16); technicians, 9.3% (n= 4/43); physiotherapist, 9.1% (n=1/11); multipurpose HCWs 9% (n=10/111); nurses, 3.1% (n=4/129); dentists, 2.7% (n=1/37) and hospital attendants, 1.6% (n=1/62) (Table 2). Out of the 15 seropositive doctors, 4.6% tested positive for both total antibody and IgG while 2.3% were tested positive for IgM antibody. A total of 9 (23.7%) serology positive participants were asymptomatic (data not shown in th table).

**Table 1. Seroprevalence among the study population according to age groups**

| Age in years, No. | COVID-19 antibody positivity, No. (%) | | |
|---|---|---|---|
| | Total antibody | IgM | IgG |
| 18-40 (n=459) | 4 (0.9) | 13 (2.8) | 11 (2.4) |
| 41-60 (n=85) | 5 (5.9) | 4 (4.7) | - |
| >60 (n= 7) | 1 (14.3) | - | - |

**Table 2. Seroprevalence among the study population according to occupation**

| Occupation | COVID-19 antibody positivity, No. (%) | | |
|---|---|---|---|
| | Total antibody | IgM | IgG |

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| | | | |
|---|---|---|---|
| Doctors (n= 131) | 6 (4.6) | 3 (2.3) | 6 (4.6) |
| Dentist (n= 37) | 00 | 1 (2.7) | 00 |
| Physiotherapist (n= 11) | 00 | 1 (9.1) | 00 |
| Nurses (n= 129) | 00 | 3 (2.3) | 1 (0.8) |
| Laboratory & OT technicians (n= 43) | 2 (4.7) | 1 (2.3) | 1 (2.3) |
| Ambulance drivers (n= 16) | 00 | 00 | 2 (12.5) |
| Hospital attendants (n= 62) | 00 | 1 (1.6) | 00 |
| Pharmacist (n= 9) | 00 | 00 | 00 |
| Multipurpose HCWs (n= 111) | 2 (1.8) | 7 (6.3) | 1 (0.9) |

Among the serology positive HCWs, 63.2% (n=24) had history of SARS-CoV-2 RT-PCR positive report in the last 3 months. The corelation between RT-PCR positivity and IgM &/or IgG detection is shown in table 3, 45.8% were tested positive for IgM, followed by 33.3% IgG and 20.8% total SARS-CoV-2 antibody. All the individuals who were tested positive for IgG had history of RT-PCR positivity >30 days prior to sample collection for antibody survey while 8.3% and 12.5% individuals with total antibody positivity had history of RT-PCR positivity 16-30 days and >30 days prior to antibody testing respectively. Among the IgM positive individuals, 16.7%, 25% and 4.2% had history of PCR positivity 15 days, 16-30 days and >30 days prior to antibody survey respectively (Table 4).

**Table 3. Corelation between RT-PCR positivity and IgM &/or IgG detection**

| **RT-PCR test** | **COVID-19 antibody positivity, No. (%)** | | |
|---|---|---|---|
| | **Total antibody** | **IgM** | **IgG** |
| Positive (n= 24) | 5 (20.8) | 11 (45.8) | 8 (33.3) |

**Table 4. Antibody status among RT-PCR positive study participants**

| **RT-PCR test positive (n= 24)** | **COVID-19 antibody positivity, No. (%)** | | |
|---|---|---|---|
| | **Total antibody** | **IgM** | **IgG** |
| 15 days | 00 | 4 (16.7) | 00 |
| 16-30 days | 2 (8.3) | 6 (25) | 00 |
| >30 days | 3 (12.5) | 1 (4.2) | 8 (33.3) |

**Discussion**

The positive serology rate in the diverse healthcare workers enrolled in the present study was found to be 6.9% during July and August 2020. At the same time, a study conducted at Mumbai, India, a worstly affected state of India reported overall 19.3% seroprevalence rate among the healthcare workers [13]. The vast variation in the seropositivity rate could be related to variation in number of cases during the period in Haryana and Mumbai, India. Additionally, in the present study, overall low RT-PCR positivity rate was observed among the patients attending the present hospital i.e. 7.2% during July and August 2020. Another study from Kolkata, West Bengal reported seroprevalence of SARS-CoV-2 among HCWs to be 11.9% [9]. Similar studies from other countries reported 0.8% to 31.2% [5-8,10-13], 6% in a multicentric study in the United States of America [5], 30% in Spain [11] and 10.6% in the United Kingdom [13]. In a study from Italy, low SARS-CoV-2 positivity rate was reported, 0% for IgM and 0.7% for IgG antibodies [14] when compared to the present study findings i.e. 3.1% for IgM and 2% for IgG. In another study from Italy, the SARS-CoV-2 antibody positivity rate was 14.4% for IgM and 7.4% for IgG [15]. In the present study, male HCWs had higher SARS-CoV-2 positivity when compared with female HCWs. Similar to

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our study, previous observational cohort study from Denmark reported higher seroprevalence in male HCWs [16].

We observed that 23.7% of serology positive participants were asymptomatic and 76.3% were symptomatic. Similar findings have been reported in previous studies i.e., higher positivity rates in symptomatic HCWs as compared to asymptomatic HCWs [17,18]. The prevalence of positive serology in asymptomatic HCWs varied from one geographical region to another, it has been reported as 0% in China, 2% in Germany, 4.3% in India to as high as 48.5% in Spain [11,17-20]. The serology positive among asymptomatic HCWs indicate the potential role of HCWs in transmission of COVID-19 between HCWs to HCW transmission or to non-COVID-19 patients within the hospital setting.

Doctors were the worstly affected subgroup (39.5% serology positive) among the study subgroups according to their job profile. This could be due to their direct and close contact with patients during the patient examination or other procedures generating aerosols. As per job profile, dentists were supposed to be the worstly affected subgroup due to their mostly aerosol generating procedures, however during the study period i.e., July and August 2020 dental hospital was almost closed.

The magnitude of SARS-CoV-2 antibody response depends on the severity of the infection, asymptomatic or mild infections. In the mild infections, antibody response may not be in a measurable amount thereby missing infections [15]. In the present study, a point-of-care (POC), rapid immunochromatography test test was used, the sensitivity and specificity of the test being 99.1% and 95.1% respectively (when compared to PCR results performed on specimens using specimens 14 days after symptom onset). Similar studies have also used POC test (lateral flow immunoassay) for assessing the prevalence of SARS-CoV-2 IgM and IgG [15,16]. Thus, HCWs with history of COVID-19 related symptoms who were not tested/tested negative by RT-PCR should be tested for antibodies at least 14 days after symptom onset.

## Conclusion

Serology for detection of SARS-CoV-2 antibodies is recommended for HCWs as this could reveal the actual burden of previous exposure to the virus, both symptomatic and asymptomatic.

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