Research Article

Exploratory Sero Prevalence of SARS-CoV-2 (COVID-19) among Health Care Professionals in Department of Community Medicine & School of Public Health (PGIMER, Chandigarh): An Exploratory Study

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Abstract

The safety of Healthcare Workers (HCWs) against SARS-CoV-2 transmission is an important aspect of managing the COVID-19 pandemic. Depending upon the level of sero prevalence of infection, public health interventions can be implemented for prevention and control of the disease. Therefore, the present study was designed to estimate the level of SARS-CoV-2 IgG antibodies among healthcare professionals in the Department of Community Medicine & School of Public Health PGIMER Chandigarh. The participants were selected by simple random sampling method. Collected serum samples were tested for the detection of IgG Antibodies against SARS-CoV-2 by using ELISA kit (Zydus Diagnostics) and results were analysed as per manufacturer's instructions. Out of total 56 participants, equal proportion of males and females participants i.e. 28 participated in study. Among these 7 participants showed the presence of IgG antibodies. Therefore, the exploratory seroprevalence of 12.5% was observed among healthcare professionals of Community Medicine and School of Public Health, PGIMER, Chandigarh, which is higher in comparison to seroprevalence, reported in general population.

Keywords: ELISA; IgG antibodies; COVID-19; SARS-CoV-2; Health care professionals

Background

The Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) known as coronavirus disease 2019 (COVID-19) had emerged from the Wuhan, Hubei province, China in December 2019 and was declared as pandemic by the World Health Organization (WHO) on 11th March 2020 [1]. Recent reports from WHO has shown 119,603,761confirmed cases of COVID-19, including 2,649,722 deaths, worldwide [2].

Community transmission is expected to rise from individuals who have no symptoms (asymptomatic). As a result, there will be an ongoing need for front-line health-care workers in patient-facing roles. Front-line health-care workers are at high risk of getting the infection as they have close proximity to patients with SARS-CoV-2, which may contribute to further spread of the disease [3]. Initial estimates suggest that front-line health-care workers could account for 10-20% of all diagnosis [4,5]. According to Ko, JH, et al., patients with subclinical infections may be missed out or may remain undiagnosed by the current symptom-based screening

strategy [6]. Recent published data have shown that asymptomatic and subclinical COVID-19 patients develop detectable amounts of anti-SARS-CoV-2 antibodies that can be detected by serological tests [6]. ELISA tests have been recommended for sero-surveys to understand the proportion of population exposed to the infection, including asymptomatic individuals [7]. A study conducted by Tanu, et al. in Mumbai (India) documented that the prevalence of infection in asymptomatic HCWs was 4.3% and 70% among asymptomatic and symptomatic HCWs respectively [8]. The safety of Healthcare Workers (HCWs) against SARS-CoV-2 transmission is an important aspect of managing the COVID-19 pandemic [9]. Depending upon the level of sero prevalence of infection, public health interventions can be implemented for prevention and control of the disease. Therefore the present study has been designed to estimate the level SARS-CoV-2 IgG Antibodies among healthcare professionals in the Department of Community Medicine & School of Public Health PGIMER Chandigarh.

Methodology

Ethical clearance: Ethical clearance for the present study was taken from Institute Ethics committee.

Study type: This is an Exploratory Study.

Study population

Study included Staff members of Department of Community Medicine & School of Public Health (Faculty, Junior/Senior Demonstrators, Junior/Senior Residents, Students/Research Staff and Office Staff and Sanitation Staff) (Table 1).

S. No	Group No.	Category	No. of Staff Members
1	Group I	Faculty	18
2	Group II	Ph.D. Students	25
3	Group III	Junior & Senior Residents	19
4	Group IV	BPH Students	22
5	Group V	MSW, PHNO, MPHW	18
6	Group VI	SD, JD, SS, LT, SA, HA	20
7	Group VII	MPH Students	26
Total			148
BPH: Bachelor in Public Health; MSW: Medical Social Worker; PHNO: Public Health Nursing Officer; MPHW: Multipurpose Health Worker; SD: Senior Demonstrator; JD: Junior Demonstrator; SS: Secretarial Staff; LT: Laboratory Technician; SA: Sanitary Attendant; HA: Hospital Attendant			

Table 1: Details of Groups of Participants.

Sampling method

Total of 148 staff members were present in the concerned department. Based on prevalence of 6% the sample size of 55 participants was calculated [3]. The selected population (55 participants) was further divided into seven groups. Each group consisted of 8 participants selected by simple random sampling method (Table 1). Demographic details were taken from all the participants.

Collection of Samples

3 ml of venous blood sample was collected in a plain vial after taking the consent from the participant. Serum was separated by centrifuging the whole blood at 1500 rpm for 10 minutes. The vial containing serum sample was labelled and stored at -20°C till further use. The samples were then used for the detection of IgG antibodies by using ELISA Covid Kavach™ (Zydus Diagnostics) kit. Analysis of results was done as per guidelines given in kit brochure.

Results

The present study comprised of 56 participants, 28 males and 28 females (Figure 1) with age group ranging from 18-58 years. Out of 56, seven participants had IgG antibodies in their serum samples (Figure 2) indicating seroprevalence of 12.5% in health care professionals of Department of Community Medicine & School of Public Health PGIMER Chandigarh.
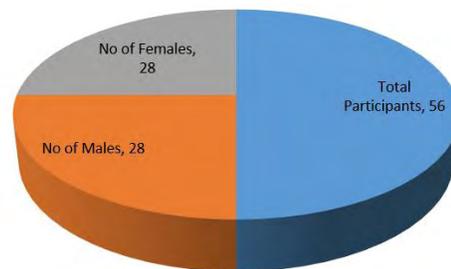

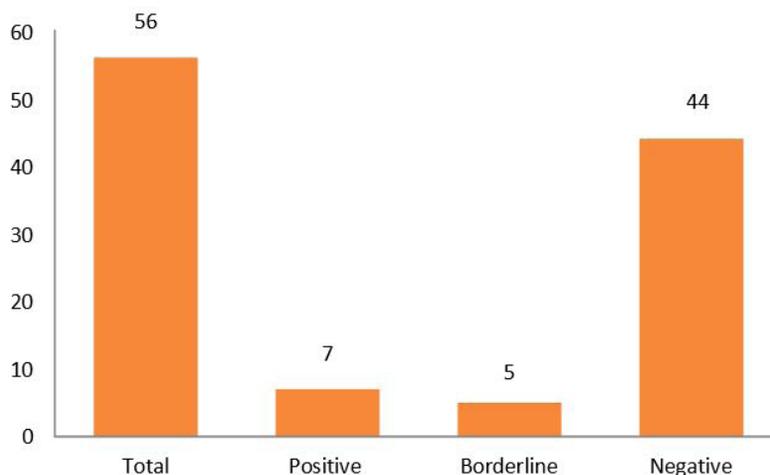**Figure 1:** Pie chart showing male vs female ratio.

Figure 2: Showing number of IgG positive, borderline and negative participants.

Out of 7 positive participants, three had history of COVID-19 infection in the past and were positive with RT PCR. Whereas rest of the positive participants were either had contact with COVID-19 positive patients or had symptoms similar to COVID-19 (Table 2). This result indicates that few patients might go unnoticed due to apprehensions of getting tested for COVID-19. Similarly, 5 participants had comparable higher OD value (above 0.20) but less than cut-off (0.29) value (Table 3). History of these participants revealed that all these had a contact history with COVID-19 patients and might not have followed COVID-19 safety guidelines of mask and social distancing.

S. No	Name	COVID-19 history (by Participant)	COVID-19 test	In Contact with COVID-19 Patient	Possibility of contact with COVID-19 Positive patient		Symptom
					Without Mask	Without Social Distancing	
1	Participant 19	Yes	Done (+ve)	Not known	Not Applicable	Not Applicable	Yes
2	Participant 41	Yes	Done (+ve)	Yes	Yes	Yes	Yes
3	Participant 08	No	Done (-ve)	Yes	No	No	Yes
4	Participant 46	No	Done (-ve)	Yes	Yes	Yes	Yes
5	Participant 47	Yes	Done (+ve)	Yes	Yes	Yes	Yes
6	Participant 54	No	Not done	Not known	Not Applicable	Not Applicable	Yes
7	Participant 56	No	Done (-ve)	Yes	Yes	Yes	Yes

Table 2: Details of IgG positive participants.

S. No	Name	COVID-19 history (by Participant)	In Contact with COVID-19 Patient	Contact with COVID-19 Positive patient		Symptom
				Without Mask	Without Social Distancing	
1	Participant 40	No	Yes	Yes	Yes	No
2	Participant 29	No	Not known	Not Applicable	Not Applicable	No

3	Participant 17	No	Yes	No	No	No
4	Participant 14	No	Not known	Not Applicable	Not Applicable	No
5	Participant 20	Yes	Not Known	Not Applicable	Not Applicable	Yes

Table 3: History of patients with higher OD value but less than cut off value.

History of participants with negative IgG value but having contact history with COVID-19 patients are shown in (Table 4). Maximum participants followed safety guidelines when they came in contact with COVID-19 positive patients. In other words, all IgG negative participants with contact history with COVID-19 patients, either followed strict mask or social distancing. This may be reason that they remain safe from COVID-19 as indicated with IgG results.

S. No	Name	COVID-19 history (by Participant)	In Contact with COVID-19 Patient	Contact with COVID-19 Positive patient		Symptom
				Without Mask	Without Social Distancing	
1	Participant 05	No	Yes	No	No	No
2	Participant 07	No	Yes	No	No	No
3	Participant 09	No	Yes	No	No	No
4	Participant 11	No	Yes	Yes	No	Yes
5	Participant 16	No	Yes	Yes	No	No
6	Participant 01	No	Yes	No	No	No
7	Participant 27	No	Yes	No	Yes	Yes
8	Participant 28	No	Yes	No	No	Yes
9	Participant 33	No	Yes	Yes	No	Yes
10	Participant 36	No	Yes	No	No	No
11	Participant 37	Yes	Yes	Yes	Yes	Yes
12	Participant 48	No	Yes	Yes	Yes	Yes

Table 4: History of participants with negative IgG value but having contact history with COVID-19 patients.

Among all 7 groups, maximum number of positivity was observed in Group V which includes MSW, PHNO and MPHW staff (Figure 3).
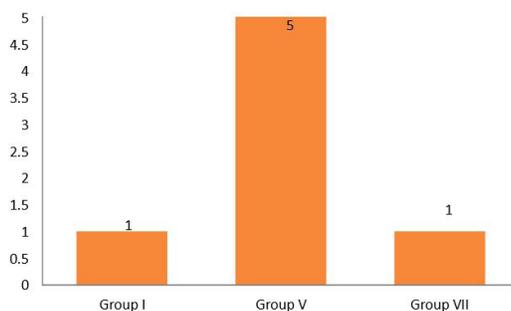

Figure 3: Graph showing group wise positivity for IgG antibody.

Out of total 56 participants in this study, total 5 (9%) stated COVID-19 positivity with PCR, out of which 3 came out positive for IgG antibodies, 1 was close to cut-off value and 1 came out to be negative indicating the good co-relation of RT PCR results with IgG antibody titre results.

Discussion

In this study seroprevalence 12.5% observed and it was comparable to reported by Goenka, et al. among health care workers which were 11.94% [10]. Similar studies on health care workers from other countries reported a percentage of as low as 0% in Malaysia [11], 4% in Denmark [12], 1.06%-13.7% in the United States of America, [13,14], 6.4% in Belgium [15] 9.3% in Spain [16], 10.6% in the United Kingdom (UK) [17,18] to as high as 17.14% in China [19,20]. This difference may be correlated to the period of study, the frequency of COVID-19 in the local community, and hospital policy in terms of triage, social distancing, hand sanitization, use of PPE. Singhal, et al. reported 4.3 % prevalence of infection in asymptomatic HCWs and 70% in previously symptomatic untested HCWs [8]. Seroprevalence among health care workers was high in comparison to general population [21].

Some of the other studies have also reported none/rare infection in the HCWs directly involved in the care of COVID-19 patients [22]. This can possibly be attributed to better Personal Protective Equipment (PPE) and heightened caution of HCWs in COVID-19 areas.

Similarly as per this study, previous studies also report higher positivity rates in HCWs with symptoms as compared to asymptomatic HCW [23]. Therefore, testing of symptomatic HCWs will be preferred than asymptomatic HCW.

The accuracy of antibody tests in COVID-19 has yet debateable [24]. Various kits are available which differ from each other, and local validation of the kits is recommended [25]. It is also known that the extent of the antibody response depends on the severity of infection; patients with asymptomatic infections/ mild infections may not mount a measurable antibody response [26]. So our results with high OD value but less than cut value of 5 participants may be due to mild infections. Hence, these antibody tests can underestimate the infection rate in those tested. Conversely, cross-reactivity with other coronaviruses may lead to false-positive results [25].

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 evidence from animal studies that previous infection with COVID-19 protects against reinfection [27]. However, questions relating to the longevity of the immune response, the level of antibodies required for protection and the relationship between binding antibodies (measured by commercial tests) and neutralising antibodies that give protection remain unanswered [25]. Besides, anecdotal cases of relapse/ reinfection of SARS-CoV-2 have also been described [28].

Baveja, et al. first studied on seroprevalence of SARS-CoV-2 among HCWs from India, where the COVID-19 pandemic is yet to peak [29]. In his study they have shown that 6.9% of the health care staff had antibody against SARS-CoV-2, with IgM antibody among 4.8% and IgG among 4.1% [29].

IgM antibodies generally rise to become detectable in approximately 5-7 days after the initial onset of symptoms and remain so for 14-21 days. About day 14, after symptom onset, IgG will rise above detection levels, peaking around or after clinical recovery and will remain detectable for months or even years after the resolution of infection [30].

Earlier studies on COVID-19 among HCWs have focused on antigen testing among symptomatic individuals or their contacts. In one of the study done among 316 HCW's of University Hospital Germany showed only 1.6%, HCW's having IgG antibodies [31]. A study among HCWs in Spain reported 31.6% of workers to be IgG positive, whereas, in a multi-hospital study in Lombardy, Italy, 3 to 43% of the health care and administrative staff were positive for IgG [32,33].

Sandri, et al. from Italy have reported significantly higher seroprevalence among females, which we did not find in our study. They also reported that middle-aged men (not women) were more likely to induce an antibody response [33].

Another study by Steensels, et al. in Belgium also provided an estimate of 6.4% of the hospital staff having IgG antibodies which were not associated with contact with COVID-19 patients in the hospitals but associated with household contact of COVID-19 patient [34].

A large hospital-based study in Syria showed high compliance with protective measures by hospital staff which was due to the training provided and was more among doctors and nurses and lower among pharmacists [35]. Even our study also showed that compliance with mask and social distancing can prevent from getting infected to large extends [36].

So in all, large scale seroprevalence studies are important to be conducted in future to estimate the percentage of population who have got exposure of COVID-19 infection. This information would be important for implementation of vaccination strategy for whole population.

Conclusions

Exploratory seroprevalence of 12.5% among healthcare Professionals of Community Medicine and School of Public

Health, PGIMER, Chandigarh, was comparable to earlier reports of health care workers and was higher in comparison to general population of India. In our study we reported higher rates of infection in the MSW, PHNO and MPHW as compared to other staff. Mask along with social distancing is effective approach to prevent the transmission.

The small sample size is the limitations of this study. There is need of larger serosurveys in HCWs and comparing them to the general population will help in further defining the epidemiology of the illness. So more studies needs to be conducted in future by taking more participants.

Acknowledgements

Ethical Approval

Took Ethical clearance from Institutional Ethical Committee (INT/IEC/2021/SPL-122).

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