



## INVESTIGATION OF SEROPREVALENCE OF IgG ANTIBODIES AMONG HEALTH CARE WORKERS IN VIRAL RESEARCH AND DIAGNOSTIC LABORATORY, AMRITSAR

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**ABSTRACT** Health care workers constitute the group of people who take care of COVID-19 patients. Thus, they are highly vulnerable to contract SARS-CoV-2 infection and pose a great threat to co-workers and general public. Seroprevalence studies are an important tool to monitor the prevalence of SARS-CoV-2 infection and assess the level of exposure among HCWs. Thus, the present study aims to investigate the seroprevalence of IgG antibodies against SARS-CoV-2 among Health Care Workers.

**Materials and Methods:** A prospective study was conducted at Viral Research and Diagnostic Laboratory, Government Medical College, Amritsar for a period from 1<sup>st</sup> December 2020 to 15<sup>th</sup> January 2021. During this period, 90 blood samples were collected from the healthcare workers from Department of Microbiology and Viral Research and Diagnostic Laboratory, Government Medical College, Amritsar. Serum samples were separated and used for detection of Anti-SARS-CoV-2 IgG antibodies by ELISA technique.

**Results:** Out of the 90 samples, 31 (34.44%) were found to be positive. Higher number of males 24 (26.67%) and lesser number of females 7 (7.78%) were observed with seropositivity. Out of the total participants in the study, 45.16% of laboratory supporting personnel, 19.35% of junior residents followed by housekeeping staff (12.90%), data entry operators (9.67%), consultants (6.45%) and Senior Residents/Research Scientists (6.45%) were observed to be IgG positive. It was also seen that in high risk exposure category 27.78% were seropositive and in low risk exposure group only 6.67% were seropositive and the difference between two groups was statistically significant ( $p < 0.000$ ).

**Conclusion:** High seropositivity was observed among health care workers due to their nature of work as frontline workers.

**KEYWORDS :** Health care workers, seropositivity, SARS-CoV-2, IgG

### INTRODUCTION:

Health-care workers (HCWs) constitute a group of frontline workforce for clinical care of suspected and confirmed cases of COVID-19. As a repercussion, they are highly susceptible to acquire the infection as compared to the general population and if infected, they pose a threat to vulnerable patients and co-health care workers.<sup>1</sup> In September 2020, the World Health Organization (WHO) reported that a 14%-35% of HCWs from various countries had contracted COVID-19 infection with significant morbidity and mortality (WHO 2020).<sup>2</sup> Previous studies have also announced COVID-19 seroprevalence rates of 17.4% among the HCWs (Brant et al 2020; Chen et al 2020; Moscola et al 2020).<sup>3,5</sup> Many frontline workers, who remain in direct/indirect contact with general population with SARS-CoV-2 infection, might be symptomatic or asymptomatic during infection or infection might be unrecognized. Therefore, it is imperative to comprehend the actual prevalence of COVID-19 infection among HCW owing to uncertainties pertaining to proportion and transmission hazard of asymptomatic cases and concern about competency to control infection (Woon et al 2020).<sup>6</sup>

Seroprevalence studies can be used to extract information on the number of people who have experienced recent or past infection. Hence, monitoring the prevalence of infection among HCW is significant for assessing the level of exposure among hospital personnel and identifying high-risk departments (Black et al 2020).<sup>7</sup> Albeit, there is growing evidence on the immunological responses against SARS-CoV-2, the correlation between seropositivity or antibody levels and protection against recurrence of infection, along with the extent of protective immunity, remains to be explicated (Huang et al 2020).<sup>8</sup> Thus, the present study aims to investigate the seroprevalence of IgG antibodies against SARS-CoV-2 among Health Care Workers Viral Research and Diagnostic Laboratory/COVID-19 testing laboratory, Government Medical College, Amritsar, Punjab.

### MATERIALS AND METHODS:

A prospective study was conducted at Viral Research and Diagnostic

Laboratory, Government Medical College, Amritsar for a period from 1<sup>st</sup> December 2020 to 15<sup>th</sup> January 2021 after obtaining approval from institution's ethical review committee. During this period, 85 blood samples were collected from the healthcare workers from Viral Research and Diagnostic Laboratory/COVID-19 testing Laboratory, Government Medical College, Amritsar. Demographic and clinical details such as name, age, gender, department, nature of work, co morbidities, etc. were recorded on a pre-designed questionnaire after obtaining informed consent.

The healthcare workers were enrolled on the basis of following inclusion and exclusion criteria.

### INCLUSION CRITERIA:

1. Healthcare workers (>18 years of age) including consultants, technicians, lab personnel, field workers, administrative personnel and other supporting staff.
2. Voluntary participation of the healthcare workers in the survey.

### EXCLUSION CRITERIA:

1. Healthcare workers who tested positive for SARS-CoV-2 infection in the last 3 months.
2. Healthcare workers who were vaccinated against SARS-CoV-2 virus.

### Collection, Transportation and processing of samples:

The blood samples (3ml) from 90 healthcare workers were collected following biosafety measures as described by WHO Guidelines 2020. Serum was separated from the blood for immunological assessments and all the samples were properly labeled and the particulars of the subject were recorded on printed proforma which was enclosed with the samples. Samples were then stored at -20°C till analysis. Serum samples were used for detection of Anti-SARS-CoV-2 IgG antibodies by ELISA technique. The data thus obtained was compiled, tabulated and analyzed statistically to obtain valid results.

### RESULTS:

Out of the 90 samples, 31 (34.44%) were found to be positive for the SARS-CoV-2 specific IgG antibodies. Mean age among IgG positive HCW was 33.14 years with higher number of males 24 (26.67%) and lesser number of females 7 (7.78%) (Table 1).

**Table 1: Total number of males and females with IgG positive antibodies and their mean age**

	Antibody Positive (IgG)	Antibody Negative (IgG)
Number (%)	31 (34.44)	59 (65.56)
Males (%)	24 (26.67)	29 (32.22)
Females (%)	7 (7.78)	30 (33.33)
Mean age	33.14 years	31.25 years

Among the total participants who agreed for the study, 45.16% of laboratory supporting personnel, 19.35% of junior residents followed by housekeeping staff (12.90%), data entry operators (9.67%), consultants (6.45%) and Senior Residents/Research Scientists (6.45%) were observed to be IgG positive (Table 2).

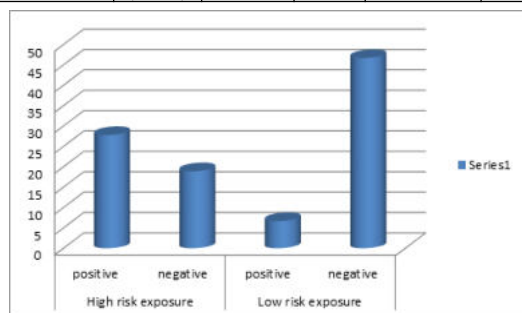
**Table 2: Number of participants with IgG positive antibodies**

Participants	n=90 (%)	IgG positive n= 31 (%)
Consultants	9 (10)	2 (6.45)
Senior Residents/Research Scientists	8 (8.89)	2 (6.45)
Junior Residents	21 (23.33)	6 (19.35)
Laboratory technicians/laboratory attendants	39 (43.33)	14 (45.16)
Data entry operator	6 (6.67)	3 (9.67)
Housekeeping staff	7 (7.78)	4 (12.90)

Further the data was stratified into high risk exposure (those who have direct contact with COVID-19 samples/contaminated surfaces/fluids/working in BSL-2) and low risk exposure categories (those who deals with analysis, reporting and data entry). It was observed that in high risk exposure category, 27.78% were seropositive and in low risk exposure group only 6.67% were seropositive and difference between two groups was statistically significant ( $p < 0.000$ ) (Table 3; Figure 1). Among all the HCW, only 7.06% were having hypertension as the comorbidity.

**Table 3: Stratification of participants into high risk and low risk exposure categories**

	High risk exposure		Low risk exposure		p-value
	Positive (%)	Negative (%)	Positive (%)	Negative (%)	
Consultants	1 (1.11)	2 (2.22)	1 (1.11)	5 (5.56)	0.000
Senior Residents/Research Scientists	2 (2.22)	2 (2.22)	0	4 (4.44)	
Junior residents	5 (5.56)	8 (8.89)	1 (1.11)	7 (7.78)	
Laboratory technicians/laboratory attendants	12 (13.33)	2 (2.22)	2 (2.22)	23 (25.56)	
Data entry operator	2 (2.22)	2 (2.22)	1 (1.11)	1 (1.11)	
Housekeeping staff	3 (3.33)	1 (1.11)	1 (1.11)	2 (2.22)	
Total	25 (27.78)	17 (18.89)	6 (6.67)	42 (46.67)	



**Figure 1: showing the percentages of HCWs in high and low risk exposure categories**

## DISCUSSION:

Health care workers who are taking care of patients infected with SARS-CoV-2 might be at a higher risk of contracting COVID-19. Thus, comprehending the prevalence risk as well as the factors associated with SARS-CoV-2 infection amid HCW play significant role in shielding both HCW and other individuals.

Our study showed that higher percentage of males (26.67%) was positive for SARS-CoV-2 IgG antibodies as compared to females (7.78%) with mean age of 33.14 years. Chen et al 2020<sup>9</sup> reported less seroprevalence (30.6%) among the people with >60 years of age as compared to individuals with age  $\leq$  60 years (46.4%) ( $p=0.023$ ) and this reflected that advancing age hampered the immune response. Preliminary studies from the Corona Immunitas on Ticino population suggested that 11% of adults between the ages ranging from 20-64 years developed detectable antibodies against SARS-CoV-2 (<https://www.usi.ch/it/feeds/14492>). Numerous serological studies from Geneva Canton, France, Italy and Spain showed similar results (Stringhini et al 2020; Pollan et al 2020; Vena et al 2020; Carrat et al 2020).<sup>10-13</sup>

The present study has reported 34.44% seropositivity among the Health Care Workers who were engaged in the management of COVID-19 patients. Similarly, a study from India observed 46.2% seropositivity owing to higher exposure to COVID-19 patients in various hospitals that particularly focused on COVID care (Sharma et al 2020).<sup>14</sup> Another report from India (Srinagar and Kolkata) showed a variation in the prevalence of seropositivity among health care workers ranging from 0.6% to 11.94% (Khan et al 2020; Goenka et al 2020).<sup>15,16</sup> Signorelli et al 2020<sup>17</sup> was the first to report highest sero-surveillance of 42% Covid-19 antibody positivity among HCWs of European continent. Few studies stated that seroprevalence aids in evaluating extension of the pandemic as well as preventive measures for HCW and also indicates the beginning of herd immunity (Bubar et al 2021; Roulit 2021).<sup>18,19</sup> The prevalence of SARS-CoV-2 antibodies amid healthy adults from various countries were Netherlands (2.7%) (Slot et al 2020),<sup>20</sup> Turkey (2.7%) (Gizem et al 2020),<sup>21</sup> Spain (11.2%) (Garcia Bastrio et al 2020),<sup>22</sup> a public hospital in New York (27%) (Venogopal et al 2020).<sup>23</sup> A Scottish study also revealed 14.5% rise in antibodies among HCW (Abo-Leyah et al 2020),<sup>24</sup> while in Japan and Rome it was 1.2% and 3.66%, respectively (Yoshihara et al 2021; Vetrugno et al 2021).<sup>25,26</sup> Variation in seroprevalence of SARS-CoV-2 antibodies ranging from 1.1% to 14.4% could be seen in population and community based studies from USA (Bendavid et al 2020; Sood et al 2020; Rosenberg et al 2020; Biggs et al 2020).<sup>27-30</sup> This variation attributes to various reasons such as different study population and study design, variety of tests performed for antibody detection, quarantine measures taken and different dates of data collection.

Present study also noticed that highest seropositivity was among Laboratory Technicians/Laboratory attendants (45.16%), junior residents (19.35%), housekeeping staff (12.90%), data entry operators (9.67%) and least in consultants (6.45%) and Senior Residents/Research Scientists (6.45%). Further analysis in the present study revealed that 27.78% of HCWs were seropositive under high risk group while 6.67% were Ab positive under low risk exposure category and significant difference was observed between the groups ( $p < 0.000$ ). Despite following the preventive measures such as usage of PPE, the study observed high seropositivity among HCWs which was due to their contact with COVID-19 samples or contaminants such as fluids or objects or surfaces or while working with samples in BSL-2 which was in line with the nature of their work. Shields et al 2020,<sup>31</sup> also found highest seroprevalence among housekeepers (34.5%), workers in acute medicine (33%) and general internal medicine (30.0%) and lowest prevalence was in individuals working in intensive care medicine (14.8%). A study from Switzerland observed that HCW who were exposed to COVID patients developed 75% more IgG antibodies as compared to non-exposed HCW and overall seroprevalence in their population was 67.1%. They have also found that the seroprevalence among frontline workers was less than double the one observed among administrative, service, and maintenance staff (Piccoli et al 2020).<sup>32</sup> In contrast, significantly lower levels of seropositivity was observed in clinical HCW (41.4%) as compared to non-clinical HCW workers (50.2%) ( $p=0.0001$ ) when stratified which may owe to awareness and use of preventive methods by HCW (Liu Min et al 2020).<sup>33</sup> Grant et al 2020<sup>34</sup> and Rudberg et al 2020<sup>35</sup> found HCWs had higher seropositivity which signifies occupational health risk as compared to general population in London and Stockholm. Numerous studies emphasized

occupational transmission risk of SARS-CoV-2 amongst HCWs as they at front line to COVID-19 and more susceptible to viral transmission (Hunter et al 2020; Canova et al 2020; Goddriess et al 2020).

## CONCLUSION:

Seropositivity among HCW was higher as they represent a group which is at a substantial risk of contracting COVID-19. Sheer adherence to preventive and control methods, adequate usage of PPE, early detection and isolation is mandatory to reduce the risk of SARS-CoV-2 infection. Moreover, studies on seroprevalence render germane information pertaining to levels of exposure amid HCWs, understanding pathways of spread of SARS-CoV-2 both in symptomatic and asymptomatic individuals and progress of interventions in clinical settings.

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