



Investigation of Seroprevalence of Sars-Cov-2 IgG Antibodies Among Healthcare Workers in a Tertiary Care Centre in District Amritsar

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Abstract

Background: SARS-CoV-2 infection poses tremendous challenge to the healthcare system of nations across the globe. Healthcare workers (HCWs) are crucial to the ongoing response to the SARS-CoV-2 pandemic. During the course of their work, they are exposed to hazards that place them at the risk of infection. Serological testing for SARS-CoV-2 among healthcare workers, which form a high risk group helps in identifying the burden of hidden infection in an institutional setting. The present study aims to investigate the seroprevalence of IgG antibodies against SARS-CoV-2 among HCWs during 1st and 2nd wave. **Material & Methods:** A prospective study was conducted at Viral Research and Diagnostic Laboratory, Government Medical College, Amritsar during June July 2020 (1st wave) and April May 2021 (2nd wave). During this period, 184 blood samples were collected from healthcare workers from Government Medical College and Hospital, Amritsar. Serum was separated and used for detection of Anti-SARS-CoV-2 IgG antibodies by ELISA technique. **Results:** Out of the 184 samples, 79 (42.9 %) were found to be seropositive. Higher seropositivity was seen i.e 60.8 % during the 2nd wave (April-May 2021) as compared to 25% during 1st wave. The increase in seroprevalence was observed in almost all categories of HCWs, Doctors 44.4% vs 13.04%, nurses 54.8 % vs 34.7 %, lab technicians 72% vs 30.4 % and housekeeping staff 72.2 % vs 21.7%. Also the unvaccinated HCWs showed higher seroprevalence during the second wave and 87.5 % of vaccinated HCWs had demonstrable IgG antibodies. **Conclusions:** High seropositivity was observed among healthcare workers due to their nature of work. Rise of seropositivity among unvaccinated HCWs during 2nd wave concludes that increase in seroprevalence was attributable to natural infection. The vaccine's immunological response was also highlighted in the study.

Keywords:- Sars-Cov-2, IgG Antibodies, Pandemic.

INTRODUCTION

Viral respiratory infections are rapidly becoming recognized as major causes of hospitalization and mortality in people of all

ages around the world. Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) and coronavirus disease 2019 (COVID-19) emerged from Wuhan, Hubei Province,

China in December 2019.^[1] Due to the rapid and worldwide spread of the virus, the WHO officially declared the COVID-19 outbreak a pandemic on 11 March 2020.^[2] In India, the first case of COVID-19 was reported on January 30, 2020.^[3] India was one of the countries hardest hit by the coronavirus disease (COVID-19) pandemic, which was caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Over 43 million cases have been reported in the country, with over 5 lakh deaths.^[4] The clinical syndrome of SARS-CoV-2 ranges from very mild symptomatology to severe pneumonia, acute respiratory distress syndrome and death.^[5] It is assumed that the actual burden of covid 19 is underestimated as only a small fraction of acute infections have been diagnosed and reported. Healthcare workers (HCW) are the most susceptible to SARS-CoV-2 infection. Caring for patients with COVID-19 (besides exposure to infected family members and colleagues or community transmission) potentially placed front-line HCW at an increased risk of becoming infected with the covid 19 virus.^[6] Knowledge of the seroprevalence of SARS-CoV-2 antibodies among HCWs is important to understand the spread of COVID-19 among healthcare facilities, to assess the success of public health interventions,^[7] and this can provide critical information about pathogen exposure, infectiousness, and the efficacy of use of personal protective equipment (PPE). Thus, the current study aims to look into the seroprevalence of IgG antibodies against SARS-CoV-2 among healthcare workers at a tertiary care hospital, Government Medical College and Hospital, Amritsar, during the first and second Covid -19 peaks in India, in

June-July 2020 and April-May 2021, respectively.

MATERIAL AND METHODS

Inclusion Criteria

1. Healthcare workers (≥ 18 yr of age), including doctors, lab personnel, nurses and housekeeping staff.
2. Healthcare workers who gave written informed consent for voluntary participation.

Exclusion Criteria

1. Healthcare workers who tested positive for the SARS-CoV-2 infection in last 2 months.

A prospective study was conducted at Viral Research and Diagnostic Laboratory, Government medical college, Amritsar during the period of June - July 2020 and April- May 2021. During this period 3 ml of blood samples were collected from different categories of 184 health care workers (92 during June-July 2020 and 92 during April-May 2021) following universal and biosafety precautions. The samples were handled and processed in a biosafety level 2 facility as per the WHO protocol.^[8] Serum was separated from the blood and proper labelling of samples was done. Informed written consent was taken from health care workers and required details were noted in printed proforma. The samples were stored at -20°C for future analysis. IgG antibodies against SARS-CoV-2 were detected by ELISA technique as per user's manual. The data thus obtained was compiled tabulated and analysed statistically to obtain valid results.

RESULTS

In April - May 2021, the seroprevalence was substantially higher than in June -July 2020. [Table 2]

Out of the 184 samples, 79 (42.9%) were found to be seropositive for SARS-CoV-2 IgG antibodies. [Table 1]

Table 1: Seropositivity among total samples

| Total samples | Seropositive | Percentage |
|---------------|--------------|------------|
| 184 | 79 | 42.9 |

Table 2: Comparative analysis of seroprevalence during 1st and 2nd Wave of Covid -19.

| Period | No. of samples tested | Seropositive | Percentage |
|---|-----------------------|--------------|------------|
| June-July 2020 (1 st wave of covid 19) | 92 | 23 | 25 |
| April-May 2021 (2 nd wave of covid 19) | 92 | 56 | 60.8 |

Table 3: Healthcare workers with IgG antibodies during June -July 2020 (1st Wave)

| Designation | Number of HCW | Seropositive | Percentage |
|--------------------|---------------|--------------|------------|
| Doctors | 22 | 3 | 13.04 |
| Nurses | 22 | 8 | 34.7 |
| Lab technician | 30 | 7 | 30.4 |
| Housekeeping staff | 18 | 5 | 21.7 |

Table 4: Healthcare workers with IgG antibodies during April-May 2021 (2nd Wave)

| Designation | Number of HCW | Seropositive | Percentage |
|--------------------|---------------|--------------|------------|
| Doctors | 18 | 8 | 44.4 |
| Nurses | 31 | 17 | 54.8 |
| Lab Technician | 25 | 18 | 72 |
| Housekeeping Staff | 18 | 13 | 72.2 |

Table 5: Seropositivity among vaccinated healthcare workers.

| Vaccination status | No of Healthcare workers | Seropositive | Percentage |
|--------------------|--------------------------|--------------|------------|
| Unvaccinated | 160 | 58 | 36.2 |
| Vaccinated | 24 | 21 | 87.5 |

Table 6: Seropositivity among unvaccinated healthcare workers

| Unvaccinated samples | No of samples | Seropositive | Percentage |
|---|---------------|--------------|------------|
| June-July 2020 (1 st wave of covid 19) | 92 | 23 | 25 |
| April-May 2021(2 nd wave of covid 19) | 68 | 35 | 51.4 |

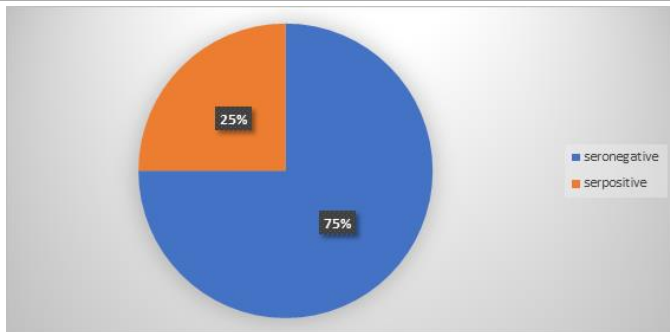


Figure 1: Seroprevalence during June - July 2020

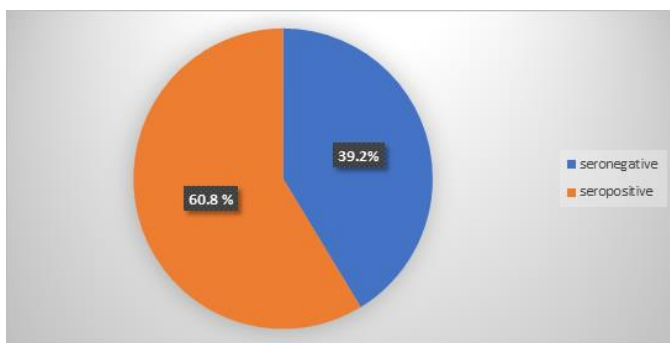


Figure 2: Seroprevalence during April -May 2021

[Figure 1 and 2] showing rise of seropositivity during the months of April -May 2021 (2nd wave).

Nurses (34.7%) and lab technicians (30.4%) showed the highest levels of seropositivity against SARS-CoV 2 infection during the first wave, followed by housekeeping employees (21.7%) and doctors (13.4%) in June and July 2020. [Table 3]

[Table 4] shows that among the total individuals who volunteered to participate in the study during April - May 2021, Lab technicians (72%) and Housekeeping employees (72.2%) had the greatest levels of

seropositivity, followed by Nurses (54.8%) and Doctors (44.4%).

When compared to the unvaccinated healthcare workers (36.2 % seropositive), seropositivity of vaccinated healthcare workers (87.5%) was substantially higher. [Table 5]

DISCUSSION

We aimed to estimate the seroprevalence of SARS-CoV-2 infection in different categories of healthcare workers working in hospital settings in a tertiary care hospital in district Amritsar during June -July 2020 (1st wave)and April-May 2021 (2nd wave). A total of 184 healthcare workers were included in the study. The present study reported seropositivity of 25% among healthcare workers who were engaged in the care of Covid 19 patients during June July 2020 (1st wave) and 60.8 % seropositivity among the healthcare workers during the months of April May 2021 (2nd wave). The studies reveal varied findings during the first and second wave of Covid 19. In a similar study, during the first wave conducted by Alberto et al among Spanish healthcare workers, the total seroprevalence came out to be 11.2%,^[9] While in a study done in healthcare workers in UK by Adrians and co-workers during the month of April 2020 revealed seroprevalence of 24.4%.^[10] Another study done by Debaprasad parai, Hari Ram Choudhary et al found out 12.5% seroprevalence among healthcare workers from various settings in India.^[11]

Overall, the seroprevalence of SARS-CoV-2 IgG antibodies increased from 25 % in June July 2020 to 60.8 % in April May 2021 [Table 2]. Natural infection as well as COVID-19



immunisation may have contributed to the increase in seroprevalence. In June July 2020, 25% of unvaccinated adults, had IgG antibodies against SARS-CoV-2 compared to 51.4% in April-May 2021. This finding suggests that during the second wave of COVID-19 in India, a major amount of the increase in seroprevalence was attributable to asymptomatic spontaneous infection or due to infection with minimal symptoms.

High seropositivity was seen among the nurses 34.7% and the lab technicians 30.4% during the first wave followed by housekeeping staff (21.7%) and doctors (13.4%). While during 2nd wave in the months of April-May 2021, Housekeeping staff (72.2%) and Lab technicians (72%) had higher antibodies followed by nurses (54.8%) and doctors (44.4%). The increase in seroprevalence was observed in almost all different categories of healthcare workers [Table 3 and 4]. In a study conducted in Mumbai by Kumar et al., ancillary workers (18.5%) were found to have considerably greater seropositivity than doctors (7%) and nurses (6.8%).^[12] This strongly supports the conclusion that there is differential risk of SARS-CoV-2 exposure within the hospital environment. The reasons underlying this are likely to be multifactorial. Despite taking preventive measures such as using PPE (Personal protective Equipment), the study found high seropositivity among healthcare personnel, which was attributable to their exposure to covid 19 samples or pollutants such as fluids or items as a result of their work. Intensive care units were designated high risk environments and there is use of enhanced PPE while fluid resistant surgical masks were recommended in other

clinical areas. Shields et al 2020, also found high seroprevalence among housekeeping workers (34.5%) and workers in acute medicine (33%).^[10] It is probably linked to doctors having better knowledge of transmission of infection and they are more aware while working in a COVID-19 care facility, use of PPE, and proper adherence to standard practice for donning and doffing.^[13] This study also revealed higher seroprevalence among housekeeping staff. This may be because of their non adherence to hygiene and infection prevention control measures and their enhanced risk of contracting infection in the community.^[14] The contribution of Enhanced PPE in protecting staff from infection with SARS-CoV-2 should be studied further.

The increase in seroprevalence during 2nd wave in the months of April -may 2021 was also due to the immune response as a result of vaccination against SARS-CoV-2. The 87.5% of vaccinated healthcare workers had demonstrable IgG antibodies. An observational multi-centre study among HCWs in India reported a seropositivity of 98.1% among Covishield recipients and 80% among Covaxin recipients.^[15]

CONCLUSIONS

Knowing the seroprevalence of SARS-CoV-2 antibodies among HCWs is helpful in determining the extent of exposure among hospital staff, as well as the effectiveness of infection control measures adopted. It also gives an idea about the preventive measures like PPE, social distancing, proper hand washing, avoiding close contact to infected persons or surroundings in preventing the exposure to infection and thus disease. Hence,

better healthcare resource allocation could be done during SARS-CoV-2 pandemic. The vaccine's immunological response was also

highlighted in the study. The current pandemic has given us an insight into dealing with future pandemics in an effective manner.

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