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# Seroprevalence of SARS-Coronavirus 2 among asymptomatic healthy blood donors from healthcare and non-healthcare settings: Implications for safety of blood donors and blood collection staff during blood donation

Hem Chandra Pandey <sup>\*</sup>, Yashaswi Dhiman, Chippy C.S., Poonam Coshic, Pankaj Jain

Department of Transfusion Medicine, All India Institute of Medical Sciences, New Delhi, 110029, India

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## ABSTRACT

**Introduction:** SARS-Coronavirus-2 pandemic has adversely affected blood supply as potential blood donors were afraid of acquiring infection in hospital settings. We aimed to compare COVID-19 seroprevalence among asymptomatic blood donors from healthcare and non-healthcare setting to analyse the difference in exposure level of each group as well as the risk of acquiring infection during the process of blood donation.

**Material and Methods:** Analysis of whole blood donors tested for SARS-CoV-2 IgG antibodies was carried out after categorizing them into healthcare workers (HCW) and non-healthcare workers (NHCW). NHCW were further categorized into residents of containment and non-containment zones and seroprevalence analyzed. Seroprevalence among different ABO blood groups was also analyzed.

**Results:** 1191 blood donors were tested for SARS-CoV-2 antibodies with 9.5 % seropositivity. Significantly lower seropositivity of 3.2 % ( $p < 0.001$ ) was observed among HCW as compared to 10.9 % seropositivity in NHCW. Among NHCW no difference in seropositivity was observed based on residence in containment or non-containment zone. Significantly higher ( $p = 0.012$ ) seroprevalence was observed among A blood group donors (12.5 %) as compared to O blood group donors (6.8 %).

**Conclusion:** Results suggests that a blood donor, in a hospital setting is less likely to be exposed to COVID-19 disease than when participating in activities of daily living. It is postulated that the lower seroprevalence among HCW as compared to NHCW reflects differences in knowledge and practice of preventive measures among these groups. The findings should instil confidence among blood donors and motivate them to donate blood without fear.

## 1. Introduction

SARS – Coronavirus 2 pandemic continues to spread across the globe with waxing and waning infection rates in different populations. In the absence of any effective treatment or a vaccine, the only preventive measures which could be practiced currently are the use of masks and proper hand sanitization measures and to limit the activities which involve large gatherings or congested closed spaces. Many countries including India have thus made these practices compulsory for their citizens. There has been a mixed response of general population to these practices in many countries with some citizens following them diligently while a few have also been opposing them.

The pandemic has also affected the perception of general public towards the hospitals. The number of patients visiting the hospital has

decreased as compared to the pre–COVID period with patients visiting the hospital only for emergencies. This was confounded by the belief that they might get exposed to the SARS–COV-2 during the time period of their stay in the hospital despite segregation of the hospital space into COVID and Non–COVID areas. Early reports from China indicating that the rate of cases in local health care workers (HCW) was three times higher than the general population added to this belief [1].

There are numerous reports showing decreasing blood donations and reduced blood supply globally [2–5]. This was attributed to the decline in the number of blood donors reaching the blood centers as well as cancellation of outdoor voluntary blood donation drives. The government-imposed lockdown during initial period of the pandemic restricting the movement of blood donors, regulation limiting the number of people who can attend large gatherings and the limited

<sup>\*</sup> Corresponding author.

E-mail address: [pandeyhemc@outlook.com](mailto:pandeyhemc@outlook.com) (H.C. Pandey).

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availability of public transport facilities was mainly implicated for this decrease in blood supply. This reduced supply was partly balanced by temporary cessation of routine outpatient department (OPD), surgeries and other medical interventions in the initial phases of lockdown but with gradual unlocking of activities a consistent supply of blood is required. Even after gradual nationwide unlocking and resumption of routine activities, blood donation has not been able to reach the pre-lockdown period.

The reason for this diminished blood supply in the post-lockdown period seems to be the perception of the general public and potential blood donors, that hospitals and hospital-based blood centers are high risk zones and the risk of acquiring SARS-CoV-2 during blood donation is high [4]. This is despite the fact that blood centers especially the blood collection areas have been designated as non-COVID areas. Although, most of the hospital based blood centers in our country are located near the emergency care areas, they are not directly involved with patient care and are considered to be at a lower risk for acquiring infection at par with the general public.

A comparison of COVID seroprevalence among the blood donors from healthcare and non-healthcare setting will help to analyse the difference in exposure level of both these populations and indirectly the chances of acquiring the infection in these settings. It will also help in identifying the level of risk to which blood collection staff is exposed and help formulate the level of protection required for them. The present study was thus aimed to compare the seroprevalence of SARS-CoV-2 among asymptomatic blood donors from healthcare community and non-health care community.

## 2. Material and method

### 2.1. Study setting

The study was carried out in a blood center of a tertiary care academic institute in North India. Permission from the institutional ethical committee was obtained to conduct the study. Our blood center is a hospital-based blood center and is located next to the emergency department. We started collecting COVID-19 convalescent plasma (CCP) from April 2020 to maintain an inventory of CCP in the pandemic period. We screened recovered COVID-19 patients to be recruited as CCP donors and whole blood donors to see the seroprevalence among them and their suitability to be used for convalescent plasma if the demand for CCP rises.

### 2.2. Study plan

Eligible whole blood donors were tested for SARS-CoV-2 IgG antibodies using Abbott Architect i1000SR immunoassay analyzer to assess their suitability as well as to check economic feasibility of testing all whole blood donors for COVID-19 antibodies to identify plasma units which could be used as CCP. Data of whole blood donors who were tested for SARS-CoV-2 IgG antibodies during the period from April to July 2020 was retrieved from blood donor records. The collected data included donation ID, donation type (voluntary/replacement donor), age, gender, residential address, occupation, ABO and Rh blood group and the results of antibody testing. The donors were categorized into healthcare workers (HCW) and non-healthcare workers (NHCW) based on the occupation information provided by the donor at the time of blood donation. We classified all healthcare service providers and other workers including the administrative staff in the hospital setting as HCW and the remaining donors were classified as NHCW. The non-healthcare workers were further categorized into donors who were from containment zones (areas considered to have high transmission rates) and non-containment zones. The donor residence was considered to be in the containment zone as per the information provided by the state authorities on the day of donation. The seroprevalence data between these different categories of blood donors was then compared. A subgroup

analysis of seropositivity and distribution of blood groups was also done to find out any differences in seropositivity among blood groups.

### 2.3. Data analysis

This collected data was coded and entered in an excel spreadsheet (Microsoft Office 365, Washington). The data was either expressed as median (interquartile range) or as percentage. Chi-square test was performed to determine the difference in proportion between each group using Medcalc online statistical software. A p value of <0.05 was considered to be significant.

## 3. Results

A total of 1191 blood donors were tested for SARS-CoV-2 antibodies during the study period with an overall seropositivity rate of 9.5 %. The study population included 95.6 % male donors and 4.4 % female donors with mean age 29 years (IQR, 25–36 years, range – 18–62 years). Voluntary and replacement blood donors were 44 % and 56 % respectively. One-fifth blood donors were HCW and four-fifth were NHCW. Among the NHCW, majority belonged to the non-containment zones.

The seropositivity among different group of donors is shown in Table 1. Statistically significant difference ( $p < 0.001$ ) between seropositivity was observed between healthcare workers who donated as compared to the non-healthcare workers who donated. There was no difference between the seropositivity among non-healthcare workers from containment and non-containment zones. A statistically significant difference ( $p = 0.003$ ) in seropositivity was also observed between voluntary and replacement blood donors. This difference in seropositivity between voluntary and replacement donors was not observed if HCW among voluntary donors were excluded before comparison. The blood group distribution of the donors is shown in Table 2. The overall seropositivity was 9.5 % with the highest seropositivity among A blood group donors (12.5 %) and lowest seropositivity among O blood group donors (6.8 %),  $p = 0.012$ . The difference in seropositivity between A and O blood group was observed to be statistically significant ( $p = 0.012$ ). There was no difference in seropositivity among Rh D positive and Rh D negative blood group donors.

## 4. Discussion

Present study showed a reverse scenario where the seroprevalence of

**Table 1**  
Donor demographics and COVID-19 seroprevalence among different groups of whole blood donors.

SN	Donor parameters	Total no (n = 1191)	Seropositive for SARS-CoV-2	p
1.	<b>Age</b>	29 (IQR, 25–36 yrs.)		
2.	<b>Gender</b>			
	Male	1139 (95.6 %)	111 (9.7 %)	
	Female	52 (4.4 %)	02 (3.8 %)	
3.	<b>Occupation</b>			
	Healthcare worker (HCW)	217 (18.2 %)	07 (3.2 %)	<0.001
	Non-healthcare worker (NHCW)	974 (81.8 %)	106 (10.9 %)	
4.	<b>Area of residence (NHCW)</b>			
	Non-containment zone	838 (86 %)	91 (10.8 %)	
	Containment zone	136 (11.4 %)	15 (11 %)	
5.	<b>Type of donor</b>			
	Voluntary donor	522 (43.8 %)	35 (6.7 %)	0.003*
	Voluntary donor (excluding HCW)	305	28 (9.2 %)	0.25*
	Replacement donor	669 (56.2 %)	78 (11.7 %)	

\* when compared to replacement donors.

**Table 2**

ABO and Rh blood group distribution of blood donors with SARS-CoV-2 seroprevalence across each blood group.

ABO Rh D	A	B	AB	O	Total	Seropositive for SARS- CoV2
<b>D positive</b>	277	391	99	343	1110 (93.2 %)	105 (9.4 %)
<b>D Negative</b>	18	29	8	26	81 (6.8 %)	8 (9.8 %)
<b>Total</b>	295 (24.8 %)	420 (35.2 %)	107 (9%)	369 (31 %)	1191	–
<b>Seropositive for SARS- CoV2</b>	37 (12.5 %)	41 (9.8 %)	10 (9.3 %)	25 (6.8 %)	–	113 (9.5 %)

SARS-CoV-2 antibodies and in-turn the exposure level in NHCW is significantly higher as compared to that in HCW. In the initial reports of COVID-19 pandemic, a high case rate of SARS-CoV-2 was observed in healthcare workers due to limited information regarding its transmission. However, as more information regarding the routes of transmission of SARS-CoV-2 has become available the exposure and infection rates in HCW have decreased [6–8]. Findings from the present report are consistent with this and add to the evidence already present. This might be due to better understanding of the routes of disease transmission by HCW as well as the importance of following practices related to wearing masks and frequent sanitization. A lower exposure rate in HCW will thus translate to a lower risk of viral transmission by blood bank staff to blood donors. The finding may also be due to personal protective equipment protecting the blood collection staff from asymptomatic but infectious blood donors. These findings suggest that if the guidelines for personal protection are followed properly, transmission of the infection may be decreased.

Incidentally, we also observed a significantly higher seroprevalence rate in the replacement blood donors as compared to voluntary blood donors. However, this difference in seropositivity was not observed if HCW were excluded from voluntary donor group and only non-healthcare workers among both the groups were compared. This indicates that the difference between replacement and voluntary donors may be due to the fact that 40 % of the voluntary donors in the present study were healthcare workers. This, thus, makes it important for blood collection staff to follow COVID-19 appropriate precautions while dealing with blood donors irrespective of whether the donor is voluntary or replacement.

Most of the hospitals in our country have segregated hospital spaces into COVID and Non-COVID areas. Blood banks situated within these hospitals have been designated as non-COVID area. Blood collection staff have been trained to follow the appropriate hand sanitization practices as well as use of provided with N-95 masks, face shields and disposable overalls to protect them from asymptomatic blood donors. Similarly, to safeguard blood donors and staff, each blood donor is screened for elevated temperature and uses hand sanitizer before entering the blood center. Donors without face masks are provided with a face mask before allowing entry. Donor room occupancy is restricted to groups of 10–15 donors depending on the space available for screening while maintaining appropriate distancing. Blood donor couches are sanitized and cleaned after each blood donation. Consequently, the fear blood donors have of being exposed to COVID-19 while donating blood in a hospital based blood center where patients being treated with and without COVID-19 is without merit. Our data further supports the fact that blood donors are in a much safer environment in the blood bank when compared to other public places such as local markets and shopping complexes as evident by the fact that there was no difference in seroprevalence and the rate of exposure in blood donors

from containment and non-containment zones. Blood centers need to inform the blood donors of the steps taken to safeguard their health and how making an appointment to donate blood contributes to donor and staff safety.

This study found a significantly higher seroprevalence of SARS-CoV-2 antibodies in blood donors with group 'A' blood as compared to those with group 'O'. Although, whether a person's ABO group predicts susceptibility to infection is controversial, our findings are consistent with other studies suggesting group A individuals are more susceptible to SARS-CoV-2 infection than individuals with other ABO groups. [9,10].

As the pandemic progresses and more and more asymptomatic but seropositive blood donors are encountered, it may become necessary to discuss if plasma from such whole blood donors could be utilized as CCP. As the immunoassays for screening of COVID-19 antibodies are becoming cheaper and fewer recovered patients are coming forward to donate CCP, plasma from whole blood donors may be a good source of CCP especially in resource poor countries with limited facilities of apheresis. However, more studies should be undertaken to ascertain the true nature of these antibodies before this plasma could be used as CCP.

The study was limited by the fact that we did not performed RNA testing of the seronegative donors mainly due to the non-availability of tests during that time as well as due to the fact that most of the testing resources were diverted at testing patients. It would have provided evidence on difference in RNA positivity between the replacement donors compared to the volunteer donors and HCW compared to NHCW and thus would have addressed the safety concerns of blood donors more conclusively.

## 5. Conclusion

Higher seroprevalence among NHCW as compared to HCW strengthens the notion that there is no need for general public to be apprehensive of higher risk of contracting COVID-19 by visiting hospitals or blood centers. A blood donor, in a hospital setting is less likely to be exposed to COVID-19 disease than when participating in activities of daily living. It is postulated that the lower seroprevalence in HCW is because closer attention is paid to proper use of personal protective equipment than that by NHCW. By following the guidelines for wearing masks as well as the sanitization measures, blood donors can help prevent the transmission of SARS-CoV-2 to fellow donors as well as to the blood collection staff. More efforts should be undertaken to educate blood donors and public in general to follow these preventive measures.

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## CRediT authorship contribution statement

**Hem Chandra Pandey, Yashaswi Dhiman, Poonam Coshic:** Conceptualization/Methodology. **Hem Chandra Pandey, Yashaswi Dhiman, Chippy C S, Pankaj Jain:** Analysis and/or Interpretation of data. **Yashaswi Dhiman, Chippy C S:** Writing: Original Draft Preparation. **Hem Chandra Pandey:** Writing: Review & Editing. **Hem Chandra Pandey, Poonam Coshic, Yashaswi Dhiman, Chippy C S, Pankaj Jain:** Final approval of the version to be published. **Hem Chandra Pandey, Poonam Coshic:** Supervision/Project Administration.

## Declaration of Competing Interest

The authors declare that they have no conflict of interest regarding the submitted article

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