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Seroprevalence of SARS-CoV-2 IgG Antibodies in Blood Donors during the Third Wave of Pandemic in Northern Pakistan

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ABSTRACT

Objective: To determine the seroprevalence of SARS-CoV-2 IgG antibodies in blood donors during the third wave of COVID 19 pandemic.
Study Design: Cross-sectional study.
Place and Duration of Study: Armed Forces Institute of Transfusion, Rawalpindi Pakistan, from May to Jun 2021.
Methodology: A total of 1023 blood donors were enrolled in this study according to calculated sample size using World Health Organization calculator. Blood samples were collected with aseptic technique for testing of transfusion associated infections including syphilis, Hepatitis B, Hepatitis C and the Human Immunodeficiency syndrome Virus along with additional testing for SARS-CoV-2 IgG antibodies.
Results: 188(18.3%) out of 1023 blood donors were found out to be positive for SARS-CoV-2 IgG antibodies. The age of donors ranged from 18-65 years with a mean age of 28.80±7.40 years. There was statistically significant association between symptoms and seropositivity (p=0.001). Most common symptoms were respiratory and least common were gastrointestinal.
Conclusion: SARS-CoV-2 IgG was found in a significant percentage of blood donors which indicated a widespread virus circulation in our population during the third wave of pandemic in Pakistan.

Keywords: Blood donors, COVID-19 IgG antibody, SARS-CoV-2

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INTRODUCTION

The causative agent for Coronavirus Disease-19 (COVID-19) is Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) which usually presents as an asymptomatic infection but may lead to severe acute respiratory illness in some patients. SARS-CoV-2 is a ribonucleic acid (RNA) virus whose primary mode of transmission is through the respiratory route which is one of the reasons for its rapid spread globally.[1] The first wave of SARS-CoV-2 in Pakistan started from 15 March 2020 and declined by the mid of June 2020. The first wave had unavailability of vaccine, antivirals and an overall confusion regarding the disease and its treatment. Majority of the patients were either asymptomatic or with mild illness and recovered without hospitalization.[2] However, a significant proportion of the population became moderate to severely ill, leading to fatalities and burden on intensive care units around the globe.[3] The second wave of the virus in Pakistan was from 1st July to 15 December 2020. Patients infected in second wave included more younger children and pregnant women. 2 In the second wave vaccination was started initially in health care workers followed by high-risk population.[4] The third wave of COVID-19 in Pakistan lasted from April to mid of July 2021. Despite the availability of vaccine in this wave, a considerable number of people were affected including children and the elderly.[5] It was expected that vaccination will halt the progression of virus but that was not the case, as evident by the emergence of the fourth wave.[6]

The gold standard for diagnosing active cases was the real time polymerase chain reaction (PCR) and this molecular testing was efficiently being performed in developed countries whereas the developing countries were lagging in the ability to do these tests due to high cost and unavailability of testing kits.[7,8] The serological tests were then introduced to detect antigen and antibody against SARS-CoV-2 using immunochromatographic, chemiluminescence immunoassay and enzyme linked immunosorbent assay formats with variable sensitivity and specificity. The purpose of these tests was rapid decision-making

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in special areas like airports and international borders where molecular testing was not possible due to time constraints.[9,10] This study was done to investigate the seroprevalence of SARS-CoV-2 IgG antibodies in blood donors during the third wave of the pandemic. The primary objective was to assess the seroprevalence of IgG antibodies in blood donors whereas the secondary objective was to determine the association between IgG seropositivity and socio-demographics (age and education), behavioral characteristics and symptoms consistent with COVID-19 infection.

METHODOLOGY

The cross-sectional study was conducted at the Armed Forces Institute of Transfusion (AFIT) Rawalpindi Pakistan, from May to June 2021. The Ethics Review Committee approval was taken (AFIT-ER-21-015) and all participants signed a written consent. The sample size was calculated using the WHO calculator with sample proportion 50% and previous prevalence of SARS-CoV-2 antibodies in blood donors 37.8% reported in a previous study from southern Pakistan.[11] Non-probability consecutive sampling technique was used.

Inclusion Criteria: Blood donors of either gender, reporting for blood donation, acceptable for blood donation according to WHO criteria were included.

Exclusion Criteria: The donors having COVID-19 like symptoms including dry cough, flu, fever, and gastrointestinal issues in the past one month were deferred and excluded from the study to prevent transfusion transmitted disease in recipients of blood products.

The structured questionnaire was used to collect donors' information including age, gender, education, past 10 days history of SARS-CoV-2 symptoms such as fever, loss of taste and smell, shortness of breath, myalgia, fatigue, body aches, gastrointestinal and respiratory infections. Serological detection of IgG SARS-CoV-2 antibody against nucleocapsid protein was done by chemiluminescent microparticle immunoassay (CMIA) by using Abbott Architect i2000SR. Internal positive, negative and cut off controls were run with each batch.[12,13]

The Statistical Package for Social Sciences (SPSS) version 25 was used to analyze the data. Mean and standard deviation were determined for qualitative data. Frequency and percentages were determined for quantitative data. The Chi square test was used to find the association between seropositivity, demography and symptoms.

RESULTS

A total of 1023 blood donors were enrolled during the study period. There were 1020 males (99.7%) and 3 females (0.3%). The average age of blood donors was 28.89±7.4 years. Out of 1023 blood donors evaluated for presence of IgG to SARS-CoV-2, 188(18.3%) were found to be positive. Seroprevalence of SARS-CoV-2 IgG antibody with respect to age groups is shown in Figure.

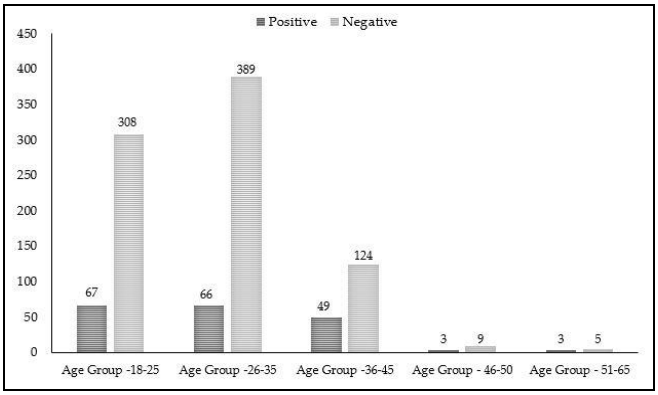

Figure: SARS-CoV-2 IgG Antibody Seroprevalence in Different Age Groups (n=1023)

There were 873(85.3%) blood donors who had COVID-19 related symptoms whereas 150 (14.6%) were asymptomatic. The significant association of seropositive and seronegative donors with relation to

Table-I: Symptoms Associated with SARS-CoV-2 in Seropositive and Seronegative Donors (n=338)

Symptoms	Total Symptomatic Cases n=338	SARS-CoV-2 IgG		*p* value
		Seropositive n=131 (%)	Seronegative n=207 (%)	
Respiratory				
Dry cough	48	17(37.5%)	31(62.5%)	0.002
Flu	68	20(38.08%)	48(69.1%)	0.015
Shortness of breath	20	11(55%)	9(45%)	<0.001
Sore throat	58	18(31.03%)	40(68.9%)	0.010
Gastrointestinal	22	9(40.9%)	13(59.0%)	0.006
General				
Fever	65	27(43.0%)	38(56.9%)	<0.001
Myalgia/fatigue	41	20(51.2%)	21(48.7%)	<0.001
Loss of taste and smell	16	9(62.5%)	7(37.5%)	<0.001

symptoms associated with SARS-CoV-2 is shown in Table-I.

In this study 144 blood donors were vaccinated, and 879 blood donors were non vaccinated. Among the vaccinated only 39(27.0%) blood donors were seropositive whereas 105(72.9%) were seronegative.

DISCUSSION

The SARS-CoV-2 pandemic is an evolving phenomenon, despite the speculation of it being ended due to mass vaccination along with adherence to non-pharmacological interventions such as face masks and implementation social distancing. While a lot of progress had been made during the first and second wave in understanding the disease and the launch of a successful global vaccination campaign, but all those efforts have failed to control or eradicate the disease. Although the gold standard for SARS-CoV-2 detection are the molecular methods, including PCR and transcription mediated amplification (TMA), serological testing plays an important role in identifying exposure to disease either recently or in the past.[13] The patients recovering from COVID-19 are initially positive for IgM followed by IgG antibodies to viral antigens like membrane, spike, envelop and nucleocapsid.[14] This seroprevalence gives an indication of exposure of population to disease and also of vaccination. In this study, out of 1023 healthy blood donors, 188(18.3%) tested positive for SARS-CoV-2 IgG antibodies in Northern Pakistan during third wave. This is not concurrent to the findings of an Indian study which reported 35.9% seropositivity rate.[15] A study from Saudi Arabia reported a comparable seropositivity rate of 19.3%.[16] However, a very low prevalence of 0.09% was found in blood donors from China which is in sharp contrast to the current findings.[17] Although the time period of sampling is different but above-mentioned studies also detected the SARS-CoV-2 antibodies during the first or second wave of SARS-CoV-2 infection. The current study demonstrated a sharp decline in the seropositivity rate when compared to the 53% found in study from Karachi, Pakistan during the second wave.[18] A study from Northern Europe reported 2.1 to 4.0% seropositivity rate for anti-SARS CoV-2 during the third wave which is in sharp contrast to the current findings.[19] Despite the free and easy availability of COVID-19 vaccines in Pakistan, a small percentage (14.1%) of blood donors gave history of COVID-19 vaccination which was less than expected. This might be due to the vaccine hesitancy regarding vaccine side effects and efficacy which is noticed in our population in a study from four provinces of Pakistan.[20] This seroprevalence shows the significant association between the symptoms and vaccination with seropositivity shown in our findings.

CONCLUSION

The SARS-CoV-2 IgG antibodies were found in a significant percentage of blood donors which indicated a widespread virus circulation in our population during the third wave of pandemic in Pakistan.

Conflict of Interest: None.

Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

MAR & RE: Data acquisition, data analysis, drafting the manuscript, critical review, approval of the final version to be published.

MK & TG: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

MAR & MA: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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