Prevalence of COVID-19 among blood donors
The Jordan University of Science and Technology experience

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Abstract

The corona virus disease-19 (COVID-19) pandemic, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection, had health and economic results that profoundly affected communities worldwide. Investigating the seroprevalence of SARS-Cov-2 in blood donors is of a significant clinical and scientific value as it adds to knowledge about local herd immunity levels.

To study the prevalence of SARS-Cov-2 infection among blood donors at a tertiary referral hospital in the north of Jordan.

This is a prospective study that included all blood donors between September 2020 and March 2021. Donors' IgG antibodies were qualitatively immunoassayed to determine the antibody status against SARS-CoV-2. The Elecsys Anti-SARS-CoV-2 technique was utilized.

One thousand samples were tested by total antibody against SARS-CoV-2. The median age was 29 years, 96.7% were males. The seroprevalence was 14.5%, and 80% of the positive participants did not report previous COVID-19 infection. The seroprevalence of COVID-19 antibodies was less among smokers and those with an O blood group and higher among donors with an AB blood group.

The prevalence of COVID-19 among healthy young blood donors at a tertiary teaching health facility in the north of Jordan was 14.5%. Smokers and those with an O blood group were less likely to be seropositive, as opposed to donors with an AB blood group.

Abbreviations: COVID-19 = corona virus disease-19, SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2.

Keywords: ABO blood groups, blood donors, COVID-19, SARS-CoV-2 antibodies, seroprevalence

1. Introduction

A new pandemic of the viral disease "corona virus disease-19 (COVID-19)" started in Wuhan, capital of Hubei province in China late in 2019. It has affected millions of people worldwide with a very high death toll.[1] This infection may manifest with minor symptoms, or alternatively may lead to a problematic differential diagnosis. Real-time reverse transcriptase-polymerase chain reaction techniques are necessary.[2–4]

The detection of the IgM and IgG antibodies against severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) may play an important role in epidemiological studies.[5] Screening of blood donors for antibodies serves as an indicator of the prevalence of infection in communities.

The first case reported for COVID-19 in Jordan was identified in March 2020 in a patient who came from Italy. This was followed by a steady climb in the total number of diagnosed cases.[6] Hundreds of cases were admitted to King Abdullah University Hospital. This hospital is affiliated to the Jordan University of Science and Technology, and is the only hospital that deals with COVID-19 cases in the north of Jordan.

At the time of the study, the national seroprevalence rates ranged between 0% and 27.4%,[7,8] and between 0% and 34.5% worldwide.[7–12]

The objectives of this study were to determine the prevalence of COVID-19 antibodies at a blood banking facility that is affiliated to a tertiary university referral hospital, and to describe some characteristics of those that test positive.

2. Methods

This is a prospective epidemiological study of COVID-19 seroprevalence among blood donors that complied with the blood donation protocol. The study took place between September 2020 and January 2021 at a tertiary-care university hospital that serves a population of 1.2 million in the north of Jordan.

The study was conducted at the height of the pandemic, where severe social restrictions and lockdown measures were in force in the governorate of Irbid, in the north of Jordan, a small country with an approximate population of 10 million. This led to a strict access to the hospital with a resultant decrease in the overall number of blood donors.

Participation in the study was voluntary. Written consent was obtained. Participants' age, gender, level of education, and addresses were recorded.

Serum samples were collected. Recombinant nucleocapsid protein against SARS-CoV-2 technique (Elecsys Anti-SARS-CoV-2, Roche Diagnostics GmbH, Mannheim) was utilized for qualitative determination of antibodies that mainly included IgG,[13] using Cobas 6000 at the biochemistry laboratory. The ABO blood group was reported for each participant.

For statistical analysis, the SPSS version 20 software was utilized. Chi-square test was used for categorical variables. Binary regression model was used to predict risk of SARS-CoV-2 infection. P value of <.05 was considered significant.

An institutional review board approval was obtained for this study.

3. Results

The characteristics of 1000 random blood donors that participated in this study are summarized in Table 1. The vast majority of participants were males, where 14.5% of the total donors were seropositive. There was no statistically significant association in relation to participants' gender, age, residency, occupation, material status, or educational level. However, smokers had a significantly lower rate of seroprevalence (Table 1).

Table 1

Demographics of blood donors, stratified by anti-SARS-CoV-2 antibodies.

	Absent (%)	Present (%)	Total (%)	P value
N (%)	855 (85.5)	145 (14.5)	1000 (100)	.494
Male gender	826 (96.6)	141 (97.2)	967 (96.7)	.693
Median age in years (IQR)	28 (13)	29 (14)	28 (13)	.465
Local residents	700 (81.9)	113 (77.9)	813 (81.3)	.261
Regional residents				
South	107 (12.6)	20 (13.8)	127 (12.7)	.699
East	48 (5.6)	12 (8.3)	60 (6)	.189
Employed	634 (74.2)	114 (78.6)	748 (74.8)	.252
Marital status				
Single	430 (50.3)	67 (46.2)	497 (49.7)	.363
Married	425 (49.7)	78 (53.8)	503 (50.3)	.363
Smoker	655 (76.6)	91 (62.8)	746 (746)	0
Education				
High school	389 (45.5)	63 (43.4)	452 (45.2)	.647
Bachelor	375 (43.9)	60 (41.4)	435 (43.5)	.577
Graduate study	49 (5.7)	12 (8.3)	61 (6.1)	.236

IQR = Inter-quartile range, SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2.

Table 2

The ABO blood group distribution in blood donors, stratified by the presence of anti-SARS-CoV-2 antibodies.

	Absent (%)	Present (%)	Total (%)	P value
A	290 (33.9)	53 (36.6)	343 (34.3)	.537
B	169 (19.8)	33 (22.8)	202 (20.2)	.407
O	336 (39.3)	41 (28.3)	377 (37.7)	.011
AB	60 (7)	18 (12.4)	78 (7.8)	.025
Rh				
Positive	749 (87.6)	128 (88.3)	877 (87.7)	.819
Negative	106 (12.4)	17 (11.7)	123 (12.3)	.819

SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2.

The ABO blood group and Rh (D) factor distribution in blood donors, stratified by the presence of anti-SARS-CoV-2 antibodies are presented in Table 2.

Binary regression test for statistically significant variables showed that the seroprevalence of COVID-19 antibodies was less among smokers and those with an O blood group, and higher among donors with an AB blood group. There was no statistically significant difference in Rh grouping. The A and B blood groups had a high Odd Ratio, but without statistically significant difference (Table 3).

4. Discussion

The north of Jordan witnessed the earliest reported cases of COVID-19 pandemic. COVID-19 antibodies seroprevalence was 14.5% after 4 months of lockdown. In a study from Amman, the capital of Jordan, there was 0 prevalence for SARS-CoV-2 antibodies at the beginning of the pandemic.[7] A later study in early 2021 of healthy blood donors from the same center reported a 27.4% seroprevalence.[8] This dramatic increase is echoed by the results of this study which was conducted between the above 2 studies.

Results of studies from Italy, China, Brazil, US, Saudi Arabia, England, Scotland, and Spain gave different seroprevalence rates that were related to different factors such as sample size, targeted population, study period, diagnostic techniques, social distancing, lockdown procedures, and the order of the infection wave.[14–21]

Most studies show different associations between blood ABO-Rh grouping and COVID-19 infections. Some studies found that the A-type blood group was associated with the highest risk of infection,[22–23] while in this study the AB-type was associated with the highest infection rate. The findings of a study from Saudi

Table 3

Predictors of SARS-COV2 infection among blood donors.

		β	OR (95% CI)*	P value
Smoking[†]	No		Reference	
	Yes	−0.657	0.518 (0.356–0.754)	.001
Blood group[‡]	O		Reference	
	A	0.419	1.520 (0.980–2.359)	.062
	B	0.421	1.524 (0.926–2.507)	.097
	AB	0.891	2.439 (1.308–4.548)	.005

CI = Class Interval, OR = Odd Ratio, SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2.
* Reference group were non-infected participants.
[†] Reference group for smoking were non-smoker.
[‡] Reference group for blood groups were O blood group participants.

Arabia[18] and another from the US[24] are similar to those of this study.

Although it seems like a paradox, data of hospitalized and non-hospitalized patients, confirm a non-association between smoking and COVID-19 disease. This study found that smoking is less likely to develop COVID-19 disease. This is in concordance with systematic reviews and meta-analyses evaluating the relationship between smoking and hospitalized COVID-19 cases in Italy, China, and USA.[25] It has been hypothesized that nicotine may have an anti-inflammatory effect that may elevate the levels of nitric oxide in the lungs, which may inhibit virus replication.[26,27]

To our knowledge this is the first study of COVID-19 prevalence in blood donors in the north of Jordan. One of the limitations of this study is the fact that most of the blood donors were males of young age. Further studies are needed to include other age groups in different communities.

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