PROGNOSTIC SIGNIFICANCE OF ABO BLOOD TYPE IN A PATIENT WITH CONFIRMED COVID-19 IN AL-MEDINA REGION

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Abstract

Coronavirus disease 2019 (COVID-19) is a pandemic with a multitude of manifestations and associations with the ABO blood group. Our study foucous the significant association of blood groups with the severity of COVID-19 disease and mortality. It was a retrospective study of patients with COVID-19 in Al Medina . Blood groups A, B, O, and AB were identified in every participant, irrespective of their RH type, and allotted groups 1, 2,3, and 4, respectively. Correlation between blood group and lab parameters was presented as histogram distributed among the four groups. Multivariate correlation and logistic regression were used for inferential statistics. The cohort included 350 patients: 136 (38.86%) participants had blood group O as the prevalent blood type. Overall, 10.21% COVID-19-related mortality was observed at our center. Mortality was 3.42% in blood group A, 2.28% in group B, 3.71% in group O, and 0.28% in AB blood group (P= <0.0001). Regarding the severity of COVID-19 disease, there was a statistical difference seen between the blood groups. In conclusion, this investigation showed a significant association of blood groups with the severity of COVID-19 disease and COVID-19 associated mortality.

Keywords: COVID-19; ABO group; SARS-COV2; mortality.

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DOI: 10.53555/ecb/2022.11.12.387

Introduction

A Typical form of pneumonia emerged by the end of 2019, the causative agent was identified to be a virus that was given the name SARS-COV2 and the resulting disease was named (COVID-19), it emerged in Wuhan, China. It speedily became a worldwide pandemic and currently remains one of the major universal health concerns regardless of the significant scientific efforts to design an effective treatment and prevention. According to the John Hopkins University and Medicine Resource Center, around 361 million confirmed cases and over 5 million covid-19 related mortality have been documented globally from December 2019 to January 2022 (MOH). In Saudi Arabia, over 667 thousand infected individuals and 9 thousand death cases related to COVID-19 were recorded as of January 2022 (MOH). The infection spreads through the touch of the contaminated surfaces and subsequent contact with the face. The severity of COVID-19 differs among patients. While some individuals report mild symptoms, others may require hospitalization and ventilation. The identification and prioritization of people with the highest risk for severe symptoms of COVID-19 is a critical challenge for the scientific community (Samra *et al.*, 2021).

COVID-19 was spread like Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) through respiratory droplets. Viral infections are caused by respiratory particles deposited on mucous membranes such as the nasal, conjunctival, and oral mucosa by inhalation. The oropharynx and upper airways contain the target host receptors. Additionally, the respiratory tract, the gastrointestinal tract, and conjunctiva can also be impacted by this infection (Hui *et al*., 2020). The initial epidemiological studies identified the key signs of COVID-19 such as fever, dry cough, dyspnea, and headache, with rapid progression to pneumonia (Zhang *et al*., 2020). As more cases were reported, additional symptoms were included in the studies.

A great similarity exists between SARS-CoV-2, SARS-CoV-1 (80%), and one of the bat viruses (96.2%) (Cevik et al.). COVID-19, an enveloped β-coronavirus. Spike (S) glycoproteins, envelope (E), and membrane (M) proteins coat the envelope of the virus (Figure 1). S protein is involved in binding and entry into the target cell. Through the specific receptor, the virus binds to a host cell. Angiotensin-converting enzyme 2 (ACE 2)'s peptidase domain binds to the receptor-binding domain of the S1 subunit of the S protein. COVID-19 is susceptible to antiviral drugs targeting its S2 subunit. Figure 1. illustrates the structure and replication cycle of COVID-19 (Cevik et al., Yan et al., 2020).

Infections caused by COVID-19 can range in severity, depending on host factors. Flow disease is mostly asymptomatic for most patients, but older individuals and those suffering from chronic diseases like hypertension, diabetes, chronic respiratory disease, heart diseases, and coincident malignancy tend to struggle more with adverse symptoms (Varughese *et al.*, 2015, Anstee, 2010). Scholars believe that, in addition to chronic illnesses and thrombo-inflammatory responses of the host, genetic makeup may play a key role in determining prognosis, treatment response, and hospitalization duration in COVID-19 patients. For H. pylori, Plasmodium falciparum, HBV, SARS-COV, and MERS-COV, investigators found a link between different ABO blood groups and infection propensity (Varughese *et al*., 2015). Again, some investigators reported a significant correlation between the ABO type and acquisition, prognosis, and mortality of the SARS-CoV-2 infection during the COVID-19 pandemic (Varughese *et al*., 2015). The scientific evidence confirming the impact of blood type on the acquisition of COVID-19 has not been published yet. However, the previous studies illustrated that a higher risk is shown in patients with group A of acquiring COVID-19, whereas blood group O individuals have a lower risk of infection and are less likely to experience severe symptoms and outcomes. In Saudi Arabia, very few investigations were accompanied to detect the correlation between blood grouping and outcomes of COVID-19 in patients (Guillon *et al*., 2008).

Aim of the study

To investigate the significant association of blood groups with the severity of COVID-19 disease and COVID-19 associated mortality.

Material and method

Study Design

A retrospective case-control study was conducted. The information was gathered at the Al-Madinah-based Prince Sultan Armed Forces Hospital. The information was gathered from the medical records of 445 COVID-19 patients between June 2020 and January 2022. Saudi and non-Saudi patients' medical records were divided into two categories. The RT-PCR test confirmed the positive diagnosis of COVID-19. Medical records were used to get the blood type information.

Statistical Evaluation

Variables were statistically analyzed using the Statistical Package for Social Sciences (SPSS)

version 26.0. The research participants' ABO blood type frequencies were determined using ANOVA tests and 95% confidence intervals (CIs), with gender subgroups considered. To analyze the link between ABO blood types and mortality, researchers used analysis of variance (ANOVA) and correlation tests. In this investigation, a $P<0.05$ was considered significant.

Ethical Approval

Ethical authorization was approved by the General Directorate of Health Affairs before the data extraction. The patient informed consent was not obtained because the study was conducted at a hospital and had a retrospective methodology. The medical records were accessed confidentially and maintained securely.

Result

Age and sex distribution of patients in the research

There were 445 SARS-COV2 qRT-PCR positive patients in the study. A total of 95 individuals were eliminated due to missing ABO blood type information. There were 232 Saudis (66.29%) and 118 non-Saudis among the research participants (33.71%). The following was the gender distribution: There were 350 men (56.28%) and 153 women (43.71%). The research participants were 64.5 years old on average (range: 18–70 years; interquartile range: [IQR] 50.0-70.0) (Figure 1; Table 1).

Table 1. Age, gender, and nationality distribution in COVID-19 patients.

Analyzed patients	**COVID-19 blood**
N	350
Median age	64.5 years (IQR 50-70)
Mean and St. Deviation of age	62.0 ±18.09
Gender	
Male	56.28% (n=197)
Female	43.71% (n=153)
Nationality	
Saudi	66.29% (n=232)
Non-Saudi	33.71% (n=118)

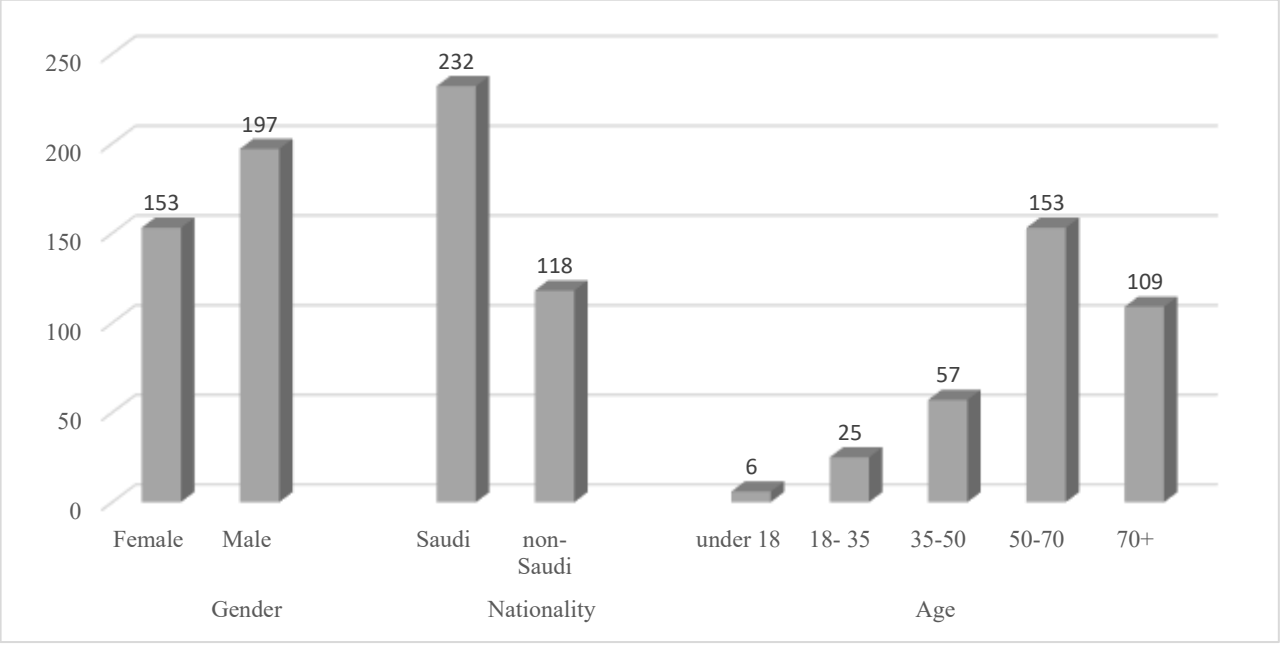


Figure 1. Age, Nationality, and gender COVID 19 cases were distributed

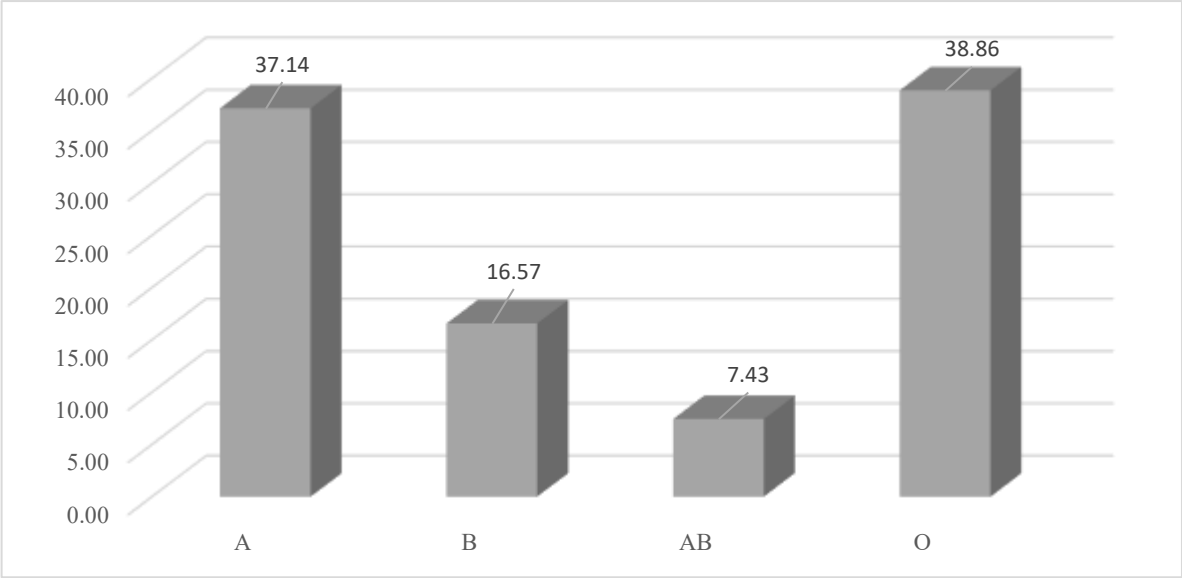
The distribution of ABO blood groups

For groups A, B, AB, and O, the ABO blood group distribution was 37.14%, 16.57%, 7.43%, and 38.86%, respectively. The blood type O was the most common (136; 38.86%), followed by A. (130; 37.14%). The difference in COVID-19 susceptibility across A, B, AB, and O blood types was not significant at $p<0.05$ (Figure 2). In the current study, the analysis found no link between the age variable and the ABO blood type (Table 2).

Figure 2. Distribution of cases as per their blood types.

Table 2. Blood type distribution in different age groups.

Blood Group	Under 18	18-35	35-50	50-70	70+	*P* value
A	2 (1.54%)	14 (10.77%)	16 (12.31%)	56 (43.08%)	42 (32.31%)	0.5431
B	2 (3.45%)	5 (8.62%)	10 (17.24%)	20 (34.48%)	21 (36.21%)	0.1191
AB	0 (0%)	1 (3.85%)	3 (11.54%)	16 (57.69%)	6 (26.92%)	0.6088
O	2 (1.47%)	5 (3.68%)	28 (20.59%)	62 (45.59%)	39 (28.68%)	0.1212



ABO blood groups in relation to COVID19 infection severity

123 (35.14%) of the research participants were admitted to the ICU, while the remainder 227 (64.86%) were inpatients. Patients with blood groups A, B, AB, and O were more likely to be admitted to the wards rather than the ICU. Those with blood types A and O had a greater risk of ICU admission (95%, CI 1.282 to 1.456, 1.292 to 1.472, respectively), but those with blood types of AB and B had a lower risk (Table 3).

Table *3*. ABO blood groups in relation to COVID19 infection severity

Blood Group	Number of patients in Wards (% total)	Number of patients in ICU (% total)	*P* value	95% CI
A	83 (23.71%)	47 (13.42%)	<0.0001*	1.282 to 1.456
B	37 (10.57%)	21 (6%)	<0.0001*	1.235 to 1.490
AB	18 (5.14%)	8 (2.28%)	<0.0001*	1.103 to 1.666
O	86 (24.57%)	50 (14.28%)	<0.0001*	1.292 to 1.472
Total	224 (64%)	126 (36%)		

*Significant $P \leq 0.05$

Analysis of Mortality in COVID-19

The sample of patients with blood type O had the highest mortality rate (13 patients, 3.71%). The lowest mortality rate was found for patients with blood type AB (1 patient, 0.28%). Table 4 illustrates the significant effect in blood groups O and A with mortality rates (P<0.0001). No significant effect between the number of deaths in

blood groups B and AB was found (Figure 3 and Table 5).

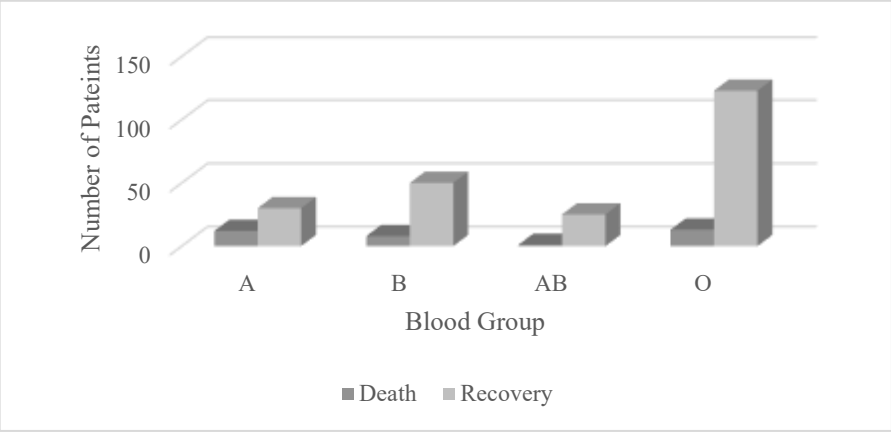


Figure 3. Analysis of Mortality of COVID-19 infection

Table 4. Analysis of Mortality in COVID-19 infection

Blood Group	Number of deaths	Number of recoveries	*P* value
A	12 (3.42%)	118 (33.71%)	<0.0001*
B	8 (2.28%)	50 (14.28%)	0.0230
AB	1 (0.28%)	25 (7.14%)	0.0572
O	13 (3.71%)	123 (35.14%)	<0.0001*
Total	350		
*Significant $P \leq 0.05$			

Discussion

Previous research looked at the relationship between ABO blood types and viral illnesses. The current study on COVID-19 patients in Saudi Arabia provided evidence that most patients had blood types O and A, 56.36% and 28.60%, respectively. The investigations conducted in the Eastern province of Saudi Arabia suggested a different ABO blood group distribution. estimated the prevalence of Saudi patients' ABO blood group in King Abdul-Aziz Medical City, Riyadh, and found out that blood type O was the most prevalent, while the least common blood type was AB (Elsayid *et al*., 2015). The variability in the prevalence of blood groups is attributed to the ethnic and geographical disparities, migration, and sample sizes (Elsayid *et al*., 2015). According to, blood type O is the most frequent in Saudi Arabia, with blood type A being the least common (Bashwari *et al*., 2001).

The link between ABO blood groups among COVID-19 patients was verified, with patients with blood group O having an increased risk and those with blood type A having a reduced risk. This contradicts the findings of a Chinese study that found that those with blood type A are more vulnerable to COVID-19 infection. The current investigation contrasted prior findings that COVID-19 was less common in people with blood type O (Zhao et al., 2021).

The analysis of the data did not establish any correlation between age, gender, and mortality of COVID-19-positive patients. Patients with blood types A and O died in a total of 9.54% of cases. However, the results showed that male patients had an overall worse prognosis compared to COVID-19-positive female patients(Zhou *et al.*, 2020). The evaluation of the risk factors affecting severity and mortality among patients revealed that ABO blood groups were one of the factors shaping the prognosis and course of COVID-19. Gender and age were not correlated to mortality in the current study (Muñiz-Diaz *et al*., 2021). However, the ABO blood types did appear to be a risk factor for COVID-19 severity and death. Blood group A and O individuals had a higher death rate when compared to blood group B and AB. This observation was confirmed when the confounding variables wereeliminated and the propensity score analysis was performed. According to the findings, people with blood type O had a substantially higher chance of death than patients with other blood types. Finally, utilizing the risk variables of age, gender, and ABO blood type, a prognostic score was developed as a consequence of this study to

predict the probability of mortality among COVID-19 patients (Muñiz-Diaz *et al*., 2021).
Finally, by combining the risk factors significantly associated with mortality (age, gender, and ABO blood group), we built a prognostic score that can be useful to predict the risk of dying in COVID-19 hospitalized patients.

Conclusion

This study showed that among confirmed COVID-19 patients, those with A and O blood groups had high susceptibility while patients in the B and AB blood groups had lower susceptibility to COVID-19 infection. In summary, the current study confirmed the existence of an association between the ABO blood group and the susceptibility to acquiring the COVID-19 infection. Group O and A individuals had a higher risk of viral infection and group B and AB individuals had a lower susceptibility. The risk of mortality in COVID-19 patients in blood group O was significantly higher than that of patients in blood group A.

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