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RESEARCH ARTICLE

SARS-CoV-2 Infection and Blood Group Associations in the United Arab Emirates

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Abstract

Background: The association between ABO blood groups and COVID-19 has been investigated globally, but there is heterogeneity in the results, with a possible trend towards susceptibility of blood group A. However, such studies are limited in our region. This retrospective study aimed to explore the potential association between COVID-19 and ABO blood groups in our population. Specifically, we investigated the role of blood groups and rhesus types in susceptibility to COVID-19 and their impact on disease severity.

Methods: We conducted a correlation study by analyzing the blood group data of 308 COVID-19-positive patients. The distribution of blood groups in our population was compared to that reported in 500 blood donors from the Al Ain area in the United Arab Emirates.

Results: Our findings revealed a higher susceptibility to COVID-19 among individuals with blood group B. However, there was no significant association between blood group B and disease severity or mortality. Additionally, rhesus type was not found to be involved in susceptibility to the disease or its severity.

Conclusion: In our population, blood group B showed a higher susceptibility to COVID-19, although it did not correlate with disease severity or mortality. These findings contribute to understanding the association between ABO blood groups and COVID-19 in our region and emphasize the need for further research to elucidate the underlying mechanisms and implications for disease prevention and management.

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1. Introduction

Since the onset of COVID-19 infection, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), a tremendous effort has been made to uncover factors that may make persons more susceptible to infection by the virus as well as risk factors that may increase severity and progression of the disease. The association of ABO blood group types known to exist with various infections and disorders has been looked at with SARS-CoV-2 as well. A number of articles from different parts of the world have reported a relationship between COVID-19 and ABO blood groups. From these studies, we notice a trend for a lower susceptibility to SARS-CoV-2 in individuals with blood group O and the highest susceptibility in individuals with blood group A[1][2][3]. In addition to the susceptibility of ABO blood groups to SARS-CoV-2, severity, and mortality were also analyzed. In our region, this interaction is seldom reported. We therefore undertook this

retrospective study to assess which ABO blood group is more frequently observed in COVID-19 patients from United Arab Emirates (UAE) and correlate that with the severity of the disease and its progression. Additionally, the rhesus type was considered in these correlations since the interaction related to rhesus has rarely been examined.

2. Methods

A cross-sectional retrospective study was carried out in two medical facilities in UAE (Sharjah University Hospital and Dubai General Hospital). The study started after approval from the institutional ethics committee and covered a six-month period starting in April 2020. A total of 308 patients who tested positive by polymerase chain reaction (PCR) for SARS-CoV-2 via a nasopharyngeal swab were included. The recruited patients were classified into three groups according to the severity of the disease: mild as cases with few symptoms not requiring admission, moderate as cases with high-grade fever, and COVID-19 pneumonia requiring admission to the “COVID-19 ward”, severe as patients with severe COVID-19, pneumonia requiring ventilation and admission to the intensive care unit. Clinical and laboratory data for all the COVID-19-infected individuals were obtained from medical records. We looked at the blood groups and Rhesus types and other demographic parameters for the assessment of frequency and severity of SARS-CoV-2 infection in each blood phenotype as well as to evaluate whether blood phenotype or Rhesus type represented a risk factor for SARS-CoV-2 infection.

3. Statistical Analysis

The Chi-squared (X^2) test was used to compare the distributions of blood groups and the severity of the disease. Odds Ratio (OR) tests were also used to study the odds of a blood type in a one-vs-all manner. ORs are reported with 95% confidence intervals. Statistical values were considered significant at p .05. Statistical analysis was performed using R Software (Version 4.4).

4. Results

Data from a total of 308 cases were collected and analyzed. The mean age was 52.5 years. The number of males was 185 (60.1%) and females 123 (39.9%). The severity of the disease was mild in 110 patients (35.7%), moderate in 85 patients (27.6%), and severe in 113 patients (36.7%). The total number of patients admitted to the intensive care unit was 114 of which 65 patients died (mortality 21.1%). The distribution according to blood group and Rhesus type is shown in (Table 1). It shows that the majority of affected patients were blood group O (46.5%), followed by blood group B (26.6%), then blood group A (20.7%) and blood group AB (6.1%). We observe for each blood phenotype, a lower frequency in Rhesus-negative patients (Table 1). Among our cohort, 42.8% had type 2 diabetes mellitus.

Table 1. Blood Groups and Rhesus Types of Distribution in COVID-19 Patients

Blood Group	Group A	Group B	Group O	Group AB	Total
Rhesus +	58 (18.8%)	76 (24.7%)	132 (42.9%)	17 (5.5%)	283 (91.8%)
Rhesus -	6 (1.9%)	6 (1.9%)	11 (3.6%)	2 (0.6%)	25 (8.2%)
Total	64 (20.7%)	82 (26.6%)	143 (46.5%)	19 (6.1%)	

4.1. Analysis of Susceptibility to COVID-19 Infection

We compared our results to the blood group distribution reported in 500 blood donors in the Al-Ain area (Table 2). We found a higher frequency of blood phenotype B in COVID-19 patients than in blood donors (26.6% vs 14.2%), a difference statistically highly significant (p-value <0.0001). The prevalence of phenotypes A and O was lower in COVID-19 patients than in blood donors, but the difference was not statistically significant.

4.2. Analysis of risk for COVID-19 infection

Patients with blood group B are at a higher risk of contracting SARS-CoV-2 infection (Odds ratio 2.19, 95% confidence range [1.53-3.13]) according to analysis of blood phenotypes (Table 2). Contrarily, the risk is lower for blood types A and O (Odds ratio, 0.74 and 0.83, respectively). Table 2 shows that rhesus type is not a risk factor for COVID-19 infection.

Table 2. Comparison of Blood Phenotypes and Rhesus Type in COVID-19 Patients and Blood Donors.

Blood Group	COVID-19 n (%)	Blood Donors n=500	Group Compared	Odds Ratio (95% Confidence Interval)	P value
A	64 (20.8%)	131 (26.2%)	A vs. non-A	0.74 (0.53-1.04)	0.08
B	82 (26.6%)	71 (14.2%)	B vs. non-B	2.19 (1.53-3.13)	<0.0001
O	143 (46.4%)	280 (56%)	O vs. non-O	0.83 (0.62-1.12)	0.2211
AB	19 (6.2%)	18 (3.6%)	AB vs. non-AB	1.76 (0.91-3.41)	0.0935
Rh+	283	452		0.83 (0.5-1.38)	0.48
Rh-	25	48			

4.3. Analysis of the Severity of COVID-19 Infection

Table 3 shows the absence of association between ABO blood groups and Rhesus types on one hand and the severity and mortality rate of the disease on the other hand.

Table 3. Prevalence of Rhesus type in each blood group according to severity and mortality.

Blood Group	Mild and Moderate Rh+/Rh-	Severe Rh+/Rh-	P value	Mortality Rh+/Rh-
A	41/3	17/3	0.3543	11/1
B	43/4	33/2	0.6962	19/0
O	83/10	49/1	0.0985	27/0
AB	10/1	7/1	1.0000	5/0

5. Discussion

The correlation between the ABO blood group system and COVID-19 infection was first reported by Zhao et al. in over 2000 positive SARS-CoV-2 patients at three different hospitals in China[3]. Patients with blood group A were found to be more susceptible to COVID-19 infection as compared to patients with blood group O. Other studies in China confirmed these results[1][2]. In other parts of the world, similar findings were reported in large cohorts[4][5]. These findings suggest that blood group O may provide protection against the infection, while people with blood group A are more susceptible to getting infected with COVID-19. Rhesus type positive was also found to be more associated with COVID-19 infection than Rhesus type negative.

In this cross-sectional study carried out in the UAE, blood group A was not found to increase susceptibility to developing COVID-19 infection. On the other hand, regarding blood group O COVID-19 patients, although their percentage was less than the control group, it was not statistically different. Therefore, blood group O was not found to confer protection against COVID-19 infection in our population. In our cohort, blood group B patients were found to be more susceptible to COVID-19 infection. Our results are in accordance with the results obtained by Jawdat et al in Saudi Arabia where blood group B was found to be a risk factor for COVID-19 and not blood group A[6]. Similar results were reported from northern Iran[7]. In India, Rana et al found in a cohort of 2586 COVID-19-infected patients from Delhi, that blood group A and B patients were more susceptible to COVID-19 infection[8]. On the other hand, in our study, rhesus positivity was not found to increase susceptibility to disease. The considerable number of diabetic patients in our study reflects the high prevalence of diabetes in the United Arab Emirates.

According to the WHO, severe COVID-19 infection affects 15-20% of the patients[9]. In our cohort, 36.7% had a severe infection, similar to the findings of Varghese et al[10]. The severity of COVID-19 infection correlation with blood groups and Rhesus factor was studied, and conflicting data are observed in the literature. Severity was either found linked to blood group A, B, or both[3][6]. When comparing mild and moderate cases to severe cases, we found that blood group type and Rh factor were neither related to severity nor to mortality. Our data are in line with other similar findings in the literature[5][6].

Statements and Declarations

Author Contributions

A.G. played a pivotal role in overseeing the conceptualization, methodology, and preparation of the original draft. H.M. significantly contributed to the conceptual framework, data curation, and investigation. R.Z.M. and N.A. focused on data collection and were instrumental in the writing process, particularly during the review and editing phases. M.H. contributed to data collection, formal analysis, and the writing of the original draft. M.M.Q. and G.O. provided essential resources and actively participated in data interpretation, and writing of the original draft. M.A.M. contributed to methodology, formal analysis, and writing during the review and editing stages. A.N. primarily focused on data interpretation and review and editing of the original draft. All authors have reviewed and approved the final draft.

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Conflict of Interests

The authors have no conflicts of interest associated with the material presented in this paper.

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