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Determining the Possible Effects of Blood Groups on Covid-19 Positivity in Humans

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ABSTRACT

Since COVID-19 disease spreads very rapidly in society, the effect of genetic blood types on people catching the disease should be investigated. In this study, the aim was to investigate whether there is a relationship between ABO and Rh blood group systems and COVID-19 disease, severity and frequency.

The blood groups of 16913 patients treated with the diagnosis of COVID-19 between March 10, 2020 and March 31, 2021 and 23141 control cases were compared retrospectively. The blood group distributions of the patients treated in the intensive care unit were examined.

Among the COVID-19 positive patients, the percentage of patients with blood group A (45.04%) was statistically significantly higher than the percentage of patients with blood group O (26.69%), blood group B (17.16%) and blood group AB (8.09%). The percentage of COVID-19 positive patients who were Rh positive (88.06%) was statistically significantly higher than the percentage who were Rh negative (11.93%). Among the COVID-19 patients, 7354 (43.48%) of 16913 patients were hospitalized and treated in the intensive care unit. The distribution of patients treated in the intensive care unit by blood group was blood group A 46.0%, blood group O 28.95%, blood group B 17.36%, and blood group AB 7.65%. In the intensive care unit, 6445 were Rh (+) (87.63%) and 909 were Rh (-) (12.36%).

It was determined that the risk of COVID-19 disease is associated with ABO and Rh blood groups. We think that blood groups have an important role in the follow-up and treatment of COVID -19 disease.

Keywords: COVID -19, blood groups, sensitivite, Rh factor, A blood group

Introduction

In 2002, infections due to coronavirus were observed as respiratory tract infections with a more severe course than cold complaints. Severe sudden respiratory failure syndrome is thought to have been transmitted from bats to civet cats and to humans through cats in the Guangdong region of China in February 2003. This disease was named SARS-CoV (1). No infections due to SARS-CoV were reported between 2004 and 2012. In 2012, a second coronavirus infection, thought to be transmitted from camels to humans, was seen in Saudi Arabia and was named Middle East respiratory syndrome with causative agent MERS-CoV. The MERS-CoV epidemic, which lasted until 2018, was detected in 2229 patients and it was reported that 791 patients died (2).

A severe acute respiratory syndrome-coronavirus-2, due to a new type of coronavirus, causing coronavirus disease-2019 (COVID-19) was reported in Wuhan, China, in November 2019. This epidemic spread rapidly around the world and was accepted as a pandemic by the World Health Organization (3). The blood type on the long arm of chromosome 9 are regulated by the ABO gene. Blood groups are named according to the presence of A and B antigens produced by A and B variant alleles (4). It was reported in the literature that blood groups and Rhesus (Rh) factor may be associated with diseases (5). There are many studies investigating the relationship between Rh factors and blood groups in malignancies, cardiovascular diseases, stroke and other diseases. According to these studies, the risks of diseases increase in certain blood groups (6,7). It is thought that blood groups may affect susceptibility to COVID-19 disease and may affect the severity of the clinical course in some patients. Studies about this subject were presented with various and contradictory findings (8,9). Therefore, the aim of this study was to examine whether there is any relationship between COVID-19 disease and blood groups, and the effect of this situation on the clinical course of the disease.

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Material and Methods

This study included 16.913 patients with clinical complaints or a history of contact who applied to the COVID-19 emergency clinic of Elazig Fethi Sekin City Hospital between March 10, 2020 - March 31, 2021. The control group comprised 23.143 patients who applied to Elazig Fethi Sekin City Hospital before the start of the COVID-19 pandemic and whose major blood group was determined. Nasal and throat swab were taken from the patients participating in the study. COVID-19 positivity was determined from the samples with the RT-PCR BIORAD (Qiagen, Germany) device. For the blood group and Rh determination of these patients, blood group and Rh determination were made with the Gel Card System (Grifols Eflexis Diana, Spain).

Statistical Analysis: Descriptive statistics for the continuous variables are presented as mean and standard deviation; while count and percentages are used for categorical variables. Independent Sample t test was used to compare means values of the groups. Two proportions Z test was also performed to compare percentage of the groups. Statistical significance level was considered as 5% and SPSS (ver:21) statistical program was used for all statistical computations.

Ethical Approval: The study protocols were approved by the Firat University Clinical Research Ethics Committee on (2021/11-43).

Results

In this study, it was determined that the percentage of male patients who were positive for COVID-19 (47.41%) was statistically significantly higher than the percentage of males who were negative for COVID-19 (32.0%). The percentage of female patients who were positive for COVID-19 (67.99%) was statistically significantly lower than the percentage of female patients who were negative for COVID-19 (52.58%). Among the COVID-19 positive patients, the patients with blood type A (45.04%) was statistically significantly higher than the percentage of patients with blood type O (26.69%), blood type B (17.16%) and AB (8.09%). The percentage of patients with COVID-19 positivity who were Rh positive (88.06%) was statistically significantly higher than the percentage of those who were Rh negative (11.93%). Among the COVID-19 positive patients, those with A Rh (+) (39.76%) blood group were higher than O Rh (+) (26.28%), B Rh (+) (15.04%), and AB Rh (+) (6.97%) blood groups. The percentage of those who were A Rh (+)was statistically significantly higher than the percentages in the other groups. Among patients who were positive for COVID-19, the patients with blood group A Rh (-) (5.28%) was found to be statistically significantly higher than the percentage of patients with blood group O Rh (-) (3.41%), B Rh (-) (2.11%), and AB Rh (-) (1.11%). The distribution of COVID-19 positive patients and control group according to gender, blood type and Rh analysis is given in Table 1. Of the 16913 COVID-19 patients, 7354 (43.48%) were hospitalized and treated in the intensive care unit. The distribution of the patients treated in the intensive care unit by blood groups was blood group A 46.0%, blood group O 28.95%, blood group B 17.36%, and blood group AB 7.65%. In the intensive care unit, 6445 were Rh (+) (87.63%) and 909 were Rh (-) (12.36%). The distribution of intensive care patients by blood group and Rh factor is given in Table 2.

Discussion

It was reported that blood groups are associated with many diseases such as autoimmune diseases, type 1 diabetes, rheumatic diseases, dengue fever, psoriasis, multiple sclerosis, and hepatitis B (5,10). According to some researchers, it was reported in the literature that there is a significant relationship between blood groups and SARS CoV disease (11). It was shown that SARS CoV makes people sick according to ABO blood groups and can produce ABO antigens in enterocytes of the small intestine, kidney distal tubular epithelial cells, and pneumocytes (12). However, there are no studies about the use of biomarkers to predict susceptibility to COVID-19. It was suggested that SARS CoV binds to sugars due to the N-acetyl galactosamine and the proteins on the surface and people with A blood group will be more affected by this virus (13). In a study examining the distribution of COVID-19 positive patients by blood groups in 105 countries, individuals with A blood group were more susceptible to COVID-19 disease and the severity of the disease increased. They reported that B blood group and O blood groups were more resistant to COVID-19 disease and experienced milder disease (14). In a study conducted in Wuhan, ABO blood groups of 265 COVID-19 positive patients were examined. The blood groups of the patients were reported as A blood group 39.3%, B blood group 25.3%, AB blood group 9.8%, and O blood group 25.7%.

Table 1. Distribution and Percentage Values of COVID-19 Patients by Blood Group and Rh Factor

	Patients (n=16913)		Control (n=23143)		p
	n	%	n	%	
Female	8893	52.58%	15737	67.99%	0.0001
Male	8020	47.41%	7406	32.0%	0.0001
A	7619	45.04%	9738	42.07%	0.0001
0	5022	29.69%	7369	31.84%	0.0001
B	2903	17.16%	4286	18.51%	0.0001
AB	1369	8.09%	1750	7.56%	0.0001
Rh +	14895	88.06%	20167	87.14%	0.0001
Rh -	2018	11.93%	2976	12.85%	0.0001
A Rh +	6725	39.76%	8548	36.93%	0.0001
A Rh -	894	5.28%	1190	5.14%	0.0001
0 Rh +	4445	26.28%	6370	27.52%	0.0001
0 Rh -	577	3.41%	999	4.31%	0.0001
B Rh +	2545	15.04%	3751	16.20%	0.0001
B Rh -	358	2.11%	535	2.31%	0.0001
AB Rh +	1180	6.97%	1498	6.47%	0.0001
AB Rh -	189	1.11%	252	1.08%	0.0001

Table 2. Distribution of COVID-19 Intensive Care Patients by Blood Group and Rh Factor

Blood group	Patients count	Percentage
A Rh(+)	2955	40.18%
A Rh(-)	430	5.54%
0Rh(+)	1892	25.72%
0Rh(-)	237	3.22%
BRh(+)	1117	15.18%
BRh(-)	160	2.17%
ABRh(+)	481	6.54%
ABRh(-)	82	1.11%
Total	7354	100%

Compared to the control group, the rate of those with A blood group was reported to be significantly higher (39.3% vs 32.3%, p=0.017), while the rate of those with O blood group was reported to be significantly lower. (25.7% vs 33.8%, P<0.001) (15). Gur Ali et al., the rate of A blood group among COVID-19 patients was above the average for Turkey (48.6% vs 42.8%). When A blood group is investigated according to Rh (+) and Rh (-), the rates of patients with A Rh (+) and A Rh (-) blood group were reported to be significantly higher than the average for Turkey (42.1% vs 37.8% and 6.5% vs 5%). They stated that the rate of COVID-19 patients according to O blood group was lower than the average for Turkey (28.2% vs 33.7%) (16). In a multicenter study by Zhao et al., the distribution of blood groups among COVID-19 patients was analyzed. They reported that blood type O was less likely to contract COVID-19 disease. In addition, they

reported people with A blood group were at high risk (17). Bhandari et al. found no relationship between ABO group and contracting COVID-19 (8). Arac et al. reported that among COVID-19 patients, A blood group was dominant over other blood groups, especially O blood group. However, they reported that there was no statistically significant difference in ABO blood groups between COVID-19 patients and healthy individuals (19). In our study, it was determined that patients with blood group A were statistically significantly more likely to catch COVID-19 compared to the control group (45.04%, 42.07%).

It was determined that the O blood group had a lower rate than the control group (29.69%, 31.84%), but it was not statistically significant. In the analysis of O Rh (–) blood group and O Rh (+) blood group, the average for patients with O Rh (+) blood group was lower than the average for Turkey (22.9% to 29.8%), while there were higher rates of patients with blood group O Rh (-) (5.4% vs. 3.9%) (17). Niles et al. reported that the rate of Rh (+) COVID-19 patients was significantly higher than Rh (-) COVID-19 patients. In addition, they determined that the risk of contracting COVID-19 was 1.4 times higher in people with Rh (+) blood groups (20). In the meta-analysis study by Zietz, Tatonetti, Latz et al., they found the incidence of COVID-19 to be significantly higher in people with Rh (+) blood groups (21,22). Bhandari et al. and Abdollahi et al. did not find a relationship between Rh positivity and contracting COVID-19 in their studies (8,23). In our study, the rate of patients with Rh (+) blood groups was higher than the rate of Rh (-) patients and a statistically significant difference was observed between them. A statistically significant difference was found between patients with Rh (+) blood groups and the control group (88.06% vs 87.14%). Similarly, a statistically significant difference was found in patients with Rh (-) blood groups (11.93% vs 12.85).

In the study by Kirisci O et al., men were diagnosed with the disease at a higher rate than women (OR= 2.091) (p=0.0001) (24). In our study, it was determined that male patients with COVID-19 were statistically significantly higher than the control group (47.41%, 32.00%).

In a study in the literature, 1667 COVID-19 positive patients were evaluated. It was determined that 175 (10.5%) of the patients were treated in the intensive care unit. The blood group distributions of the patients in the intensive care unit were 42.28% A blood group, 21.14% B blood group, 26.85% O blood group, and 9.71% AB blood group. According to the Rh factor, Rh (+) was determined as 98% and Rh (-) as 8% (25). In another COVID-19 intensive care study, blood group distribution rates for 644 COVID-19 patients were determined; A blood group was 43%, B blood group was 15.8%, AB blood group was 9.3%, and O blood group was 31.8%. In our study, it was determined that 7354 (43.48%) of the patients hospitalized due to COVID-19 were treated in the intensive care unit. Among these patients, it was determined that A Rh (+) blood group patients had the highest rate with 40.18%, while AB Rh (-) blood group patients had the lowest rate with 1.11% (26). According to the Rh factor, we found Rh (+) was 87.63% and Rh (-) was 12.36%.

In this study, there was a statistically significant difference between the ABO groups and Rh factor in patients hospitalized for COVID-19 disease. It was determined that male patients in our study group were significantly higher than the control group. Catching COVID-19 disease depends on many factors. We can say that all parameters of patients with COVID-19 should be evaluated according to the general populations around the world. It is suggested that blood groups and gender are parameters that should be taken into account.

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