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Full Length Research Article

Relationship Between Blood Groups, Rh Factor and Covid-19 Infection In Diyala Governorate, Baqubah

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ABSTRACT

Coronavirus (COVID-19) is one of the most dangerous pathogens affecting vertebrates, with most patients suffering from fever, dry cough, muscle pain, difficulty breathing, runny nose, and sore throat. It was first discovered in December 2019 in Wuhan, China. This virus belongs to the ribonucleic acid (RNA) viruses that infect many animals, such as bats, cats, and camels. This virus is transmitted to humans when they come into contact with these animals or their waste. This retrospective cross-sectional study was conducted on people who had previously been infected with the COVID-19 pandemic in the city of Baqubah from September 2023 to January 2024, and included 200 volunteers confirmed to be infected with COVID-19, whose ages range from 16 to 75 years. This study aim was to find the relationship between blood groups and prevalence of COVID-19. Blood samples were analyzed for ABO blood group and Rhesus (Rh) factor of the participants using Standard haematological techniques. The results showed that the infected individuals were 110 (55%) males and 90 (45%) females ($P>0.05$). The infection rates according to blood groups, A, O, AB, and B were 57.5%, 24.0%, 13.0%, and 5.5% respectively ($P<0.05$). Individuals with Rhesus factor positive contributed 93.5% cases while those with negative Rh contributed 6.5% ($P<0.05$). Age group 21-40 years had highest, 39.0% contribution while those > 60 years had least, 6.5% contribution ($p < 0.05$). In conclusion, this study recorded significant between COVID-19 infection and the following variables: ABO blood groups, age groups, and Rh factor.

Keywords: COVID-19, Blood Groups, Rh, age, gender, relationships

INTRODUCTION

In December 2019, several cases of infectious pneumonia were discovered in the populated city of Wuhan, China, and those reported cases were later found to be caused by the new virus, later named Covid by the World Health Organization (WHO) (Salehi *et al*., 2020; Khan *et al*., 2023; Ali *et al*., 2023). The Coronavirus (COVID-19) has become a global threat due to the speed and ease of its spread through close contact. The main mechanism of transmission is through respiratory droplets containing infectious virus particles. These droplets are transmitted during coughing, breathing, sneezing, and speaking through air and contact. Symptoms of infection usually appear after the incubation period, which ranges from 2 to 14 days of exposure to the virus (Mehrmolaei *et al*., 2023; Hussein *et al*., 2023**).** This virus belongs to the family of RNA viruses that infect some animals such as cats, bats, and camels, and are contagious to humans upon contact with those animals (Andersen *et al*., 2020; Mohammad, 2023; Amin and Ahmed, 2023**)**. Corona virus is one of the most dangerous pathogens to infect vertebrates, with most patients experiencing fever, dry cough, muscle pain, and difficult breathing in addition to some symptoms the upper respiratory system such as sneezing, Runny nose, and sore throat (Khan *et al*., 2020). Lung inflammation is also the main symptom presented by COVID-19 patients in hospitals, and about 5% of these patients deteriorate, there by requiring intensive care (Fei *et al*., 2020). Patients suffer from symptoms that include fever, shortness of breath (Rothe *et al.*, 2020). Since its discovery, the COVID-19 has caused about 268 million infections and about 5 million deaths around the world, including more than 2 million infections and about 23,000 deaths in Iraq (Al-Mafrgie, 2022). About 80% of infected people do not show symptoms but are infectious, while some individuals suffer from relatively mild symptoms, such as cough, fever and severe respiratory complications. The difference in clinical features of COVID-19 is due to differences in the body's immune response (Costa *et al.*, 2020). According to some observations and clinical signs appearing on various infected people, many demographic characteristics, such as age, gender, and some chronic medical conditions, are considered risk factors for infection with COVID-19 (Chen, 2010).

The blood group system has existed since 1901, when the first blood group was discovered. Since that time, many studies have been conducted on the relationship between blood groups and the incidence of various diseases, as blood groups are biologically linked to many diseases that affect humans, especially diseases related to the blood and blood vessels, heart diseases, and cancer. Studies have focused on the relationship between blood group and infection with some viruses, such as hepatitis B virus. The most recent of which are some studies conducted on COVID-19 patients. For instance, a group researchers showed that people with blood group A are more susceptible to infection with coronavirus than other blood groups (Samadizadeh *et al*.,2021). Some other studies were able to find a link between blood group and the rate of infection with COVID-19, and some of which failed to prove that relationship, leading to existing controversy on the relationship and its circumstances (Liu *et al*., 2021; Jing *et al*., 2020)**.** Therefore, the aim of this study was to find the relationship between blood groups and prevalence of COVID-19.

MATERIALS AND METHODS

Study Design

This retrospective cross-sectional study was conducted on people who had previously been infected with the COVID-19 pandemic in the city of Baqubah from September 2023 to January 2024. The

study was approved by the Scientific Division at the Technical Institute - Baqubah. Patients of both genders and different age groups who volunteered for the study were enrolled.

Samples collection

A total of 200 blood samples were collected from volunteers who were confirmed to be infected with Covid-19, from September 2023 to January 2024. Data on gender, age, and blood group were recorded while the Blood group and Rh factor were confirmed by using standard haematological techniques to analyze the blood specimen collected. The age range of the study participants was between 16 and 75 years.

Determination of Blood Groups

The 3 drops of blood sampled from, each participant was placed on a clean glass slide, and the first drop was mixed with anti-A serum, while the second drop was mixed with anti-B serum. Depending on the coagulation, blood Groups were determined as shown in the Table1 (Zietz *et al*., 2020).

Table 1: Classification of blood groups according to types of antigens A and B

ABO Type	Antigen	Reaction	
		Anti - A	Anti - B
AB	A, B	+	+
A	A	+	-
B	B	-	+
O	Not Found	-	-

Determination of Rh Factor

One drop of blood from each participant was placed on a clean glass slide and mixed. A with anti-D serum. The test was considered positive if agglutination appeared, while it was considered negative if no agglutination appeared (Zietz *et al*.,2020).

Data Analysis

Data generated from the study were entered into tables using SPSS version 25, and later analyzed using the chi-square (χ^2) test to compare with percentages. P-value was calculated and a significant difference was considered if it was less than 0.05.

RESULTS AND DISCUSSION

Table 2 shows the Gender, age groups, blood groups, and Rh factor of volunteers in this study, The numbers of infected individuals were 110 males (55%) and 90 females (45%). The order of blood group according to the numbers of infected people was A > O > AB > and B with percentages of 57.5%, 24.0%, 13.0%, and 5.5%, respectively. A total of 187 individuals (93.5%) had Rh factor positive while only 13 (6.5%) had Rh factor negative. For age groups, the highest infection of 78 individuals (39.0%) was in the group 21-40 years while the least was 13 individuals (6.5%) found in the age group >60 years. There were highly significant differences at the probability level of P>0.05 between blood groups, age groups, and Rh factor to the infection rate with COVID-1.

The infection is more common among males than females, perhaps males spend most of their time outside the home due to the nature of their work and thus are more in contact with infection factors, thus more susceptible to infection.

The current study shows that there is a highly significant difference in the number of infected persons between the blood groups. The highest infection rate was among individuals with blood group A, and the lowest infection rate was among individuals with blood group B.

Table 2: The demographic characteristics of the COVID-19 patients studied.

Characteristics		Number examined	Percentage (%)	P - value
Gender	Males	110	55.0	P>0.05
	Females	90	45.0	
Age groups (years)	1-20	59	29.5	P<0.001***
	21-40	78	39.0	
	41-60	50	25.0	
	>60	13	6.5	
ABO groups	A	115	57.5	P<0.001***
	B	11	5.5	
	AB	26	13.0	
	O	48	24.0	
Rh	Positive	187	93.5	P<0.001***
	Negative	13	6.5	
	Total	**200**	**100**	

The relationship between gender, age, ABO, and Rh for COVID-19-infected people is shown in Table 3. It was reported shortly after the COVID-19 pandemic that there is a link between blood group and susceptibility to COVID-19 infection. Although there is no clear evidence for this relationship, an explanation has been given that an interaction occurred between antibodies carried on the surfaces of red blood cells and antibodies to the virus. This is evidenced by noting that blood group O is the least susceptible to infection because it possesses two types of antibodies, A and B (Moslemi *et al*., 2023; Mankelow *et al*., 2021; Matzhold *et al*., 2021; Göker *et al*., 2020**).**

Study (Zhao *et al*., 2021) have found a relationship between blood group and viral respiratory infections such as seasonal influenza and acute respiratory syndrome, and indicated that there is a relationship between an individual's blood group and the response to infection with the emerging coronavirus (COVID-19) and its importance in determining the course of the disease. However, this relationship is still debated, and it is necessary to understand the impact of the potential risk factor so that concerned individuals can take the necessary extra precautions to prevent or reduce the incidence of infection. Some reports have revealed the occurrence of blood clots in COVID-19 patients, perhaps due to the presence of an immune response within the blood vessels that causes blood clots (Zhao *et al*., 2021). Blood group antigens play a direct role in causing injury and infection through certain mechanisms. These antigens may serve as receptors for contracting diseases (Tiongco *et al*., 2020**).**

A study was conducted on 265 patients infected with the COVID-19 virus. It was noted that blood group A was significantly higher in infected individuals, while blood group O in infected individuals was significantly lower (Fan *et al*., 2020). Another study conducted on 105 infected people, their possession of blood group A was a risk factor for infection with COVID-19 (Fan *et al*., 2020). In a similar study conducted on 14,112 individuals

who tested positive for COVID-19 in the New York hospital system, it was reported that blood groups A, AB, and B were most frequently encountered among those infected (Zietz *et al*., 2020). An Iraqi study indicated that blood group A increases the risk for infection with COVID-19, but blood group O is less dangerous for infection (Al-Khikani., 2020).

Table 3: Relationship of gender, age, ABO, and Rh of COVID-19 infected people

Characteristics			Covid-19 infected		P-value by χ^2
			Number	Percentage (%)	
Age groups (years)	1-20	Male	27	24.5	P>0.05
		Female	32	35.6	
		Total	**59**	**29.5**	
	21-40	Male	47	42.7	
		Female	31	34.4	
		Total	**78**	**39.0**	
	41-60	Male	30	27.3	
		Female	20	22.2	
		Total	**50**	**25.0**	
	>60	Male	6	5.5	
		Female	7	7.8	
		Total	**13**	**6.5**	
ABO blood group	A	Male	66	60.0	P>0.05
		Female	49	54.4	
		Total	**115**	**57.5**	
	B	Male	6	5.5	
		Female	5	5.6	
		Total	**11**	**5.5**	
	AB	Male	12	10.9	
		Female	14	15.6	
		Total	**26**	**13.0**	
	O	Male	26	23.6	
		Female	22	24.4	
		Total	**48**	**24.0**	
Rh factor	Positive	Male	101	91.8	P>0.05
		Female	86	95.6	
		Total	**187**	**93.5**	
	Negative	Male	9	8.2	
		Female	4	4.4	
		Total	**13**	**6.5**	

The relation between blood group and SARS-CoV-2 infection refers to A or B antibodies acting as virus-neutralizing antibodies by binding to A-antigens expressed in the viral envelope, thus preventing virus infection (Goel *et al*., 2021)**.** A study found a link between rheumatic diseases, cancer, cardiovascular disease, bacterial and viral infectious diseases, and blood group, and there was a

difference in susceptibility to infection with viruses such as hepatitis B virus, human immunodeficiency virus, rotavirus, and COVID-19 (Mehta., 2005)**.** Another study conducted in China revealed that there is a high risk of infection for people with blood group A, or a lower risk for people with blood group O (Sticchi Damiani *et al*., 2023)**.**

An early effective immune response by the body can reduce the viral load and prevent the infection from reaching the lungs, while an intense immune response can cause an excessive inflammatory reaction that leads to severe adverse effects (Shibeeb and Khan,2021). Moreover, statistics indicate that the prevalence of diabetes, High blood pressure, and liver disease are among COVID-19 cases, which means that metabolic disorders have a role in directing the response to infection. (Shibeeb and Khan., 2021; Costa *et al*., 2020).

The current results indicate a lower relative risk in people with the O blood group. The reason may be the low rate of clotting factor activity or Von Willebrand factor as well as the abundance of antibodies in people with the O blood group (Singh *et al*., 2021).

CONCLUSION

The results of the current study indicate that the infection rate was higher among males than females, and the highest infection rate was in the age group 21-40 years. The study indicates that the highest infection rate was among individuals with blood group A, at a rate of 57.5%, and the least rate was among those with blood group B, at 5.5%. For the Rh factor, most of the infections were positive for the Rh factor, reaching 93%. There is a relationship between the blood group and the infection with COVID-19, which requires more studies and investigations to clarify this ambiguous relationship.

ETHICAL APPROVAL

The consent of the study participants was obtained, and they were informed of the objectives of the study and their freedom to refuse participation, as well as informing them of the confidentiality of their data.

Limitations imposed on the study.
Sample size may affect the results of the study and therefore the result cannot be generalized. In addition, the participants were volunteer Covid-19 patients.

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Conflicts of interest
There are no conflicts of interest.

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