The association of ABO and Rh blood groups with Covid-19 of Al-Duloiya population in Salah Al-Din Governorate / Iraq

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ABSTRACT

The proportion of blood group AB in patients with Covid- 19 was higher than that in healthy control. The risk for AB blood group individuals to acquire Covid – 19 infection was higher with a relative risk of AB (RR = 1.808). in addition blood group O in patients with Covid – 19 was lower than in healthy individuals. The risk ratio of O (RR = 0.901). From the other hand, Rh⁻ blood group in patients with Covid – 19 was clearly higher than that in healthy individuals. The risk of Rh⁻ blood group individuals was higher with an (RR = 2.256) compared with of Rh⁺ blood group with relative risk (RR = 0.856).

1. INTRODUCTION

Coronavirus disease 2019 (Covid_19) is a disease caused by a new strain of coronavirus, and was first discovered when an outbreak occurred in December 2019 in Wuhan in china [19]. Coronaviruses were discovered in 1960, which induced bronchitis in animals, many viruses of this family were newly discovered, as SARS virus 2003, the Human Coronavirus NL63 in 2004, Virus Corona HKUI in 2005, the Corona MERS virus in 2012, and Coronavirus n Cov-2019 [20], [6]. Some studies showed that the blood group can play a major role in the possibility in infected and protected with Covid-19 [13]. The individuals with Blood group type A had a high risk to gain infection with this virus than the individuals with other blood groups [5], while individuals with O blood group have a reduced chance to gain infection with virus. Another studies didn't proved that blood group are a main cause in possibility to infected with this virus, and they mentioned that the genetic diversity may be a main causes [14]. Other studies showed that the blood group of individuals has no effect on the risk of viral infection [8]. This study was aimed to detect the association between the blood groups ABO and Rh and the infection with novel Coronavirus.

2. Materials & Methods

2.1 Blood samples collection

1303 blood samples were collected from individuals, their ages were ranged between 18 to 80 years, 397 samples of them were positive with Covid-19, and 906 were healthy individuals.

2.2 Inheriting ABO, and Rh blood groups

The procedure of inheriting ABO blood groups was done by agglutination test using anti-A, and anti-B reagents [11] and the agency is:

Blood groups	Antigen	Interaction with antibodies	
		Anti-serum A	Anti-serum B
A	A	+	-
B	B	-	+
AB	A,B	+	+
O	Negative	-	-

The procedure of inheriting the Rh group was also done by agglutination test using anti-D reagent [16] and the agencies:

Blood groups	Antigen	Anti-D
Rh+	D	+
Rh-	_	_

2.3 Statistical Analysis

The data were statistically analyzed by the (Mini tap) Version 17 application using the Contrast Analysis Test (ANOVA) [2]. Sample size in the community of Al-Duloiya town was determined by Steven Thompson's equation (2012)

The allelic frequencies i, IB, IA controlled by ABO blood groups has also been calculated according to [4] my agencies:

Recessive allele frequency i $(r) = \sqrt{r} = \sqrt{O}$

allele frequency I^A I^A (P)= 1- $\sqrt{(B+O)}$

allele frequency I^B I^B (q)= 1- $\sqrt{A + O}$

Allelic frequency of the Rh blood group was also calculated by [18] where:

D(P)=1-q & d (q) = $\sqrt{q2}$.

3. Results & Discussion

Table (1) shows the results of the observed frequency of the appearance patterns of ABO blood groups for coronavirus patients and the healthy in the population of Al-Duloiya town, which indicates significant differences between them (P<0.001, RR =RR 1.808) The results also indicate a high incidence in AB blood

group people and a difference of nearly half among people in both infected and healthy people compared to other blood groups that did not indicate any rise except the blood group B, which showed a slight increase among patients.

Table (1): Observed frequency of the phenotype of ABO blood groups of infected and non-infected Al-Duloiya population

Blood Groups	Non infected %	Infected %	RR	X^2 (1d.f)
A	243 (%26.8)	90 (%22.6)	0.931	
B	126 (%13.9)	63 (%15.8)	1.141	
AB	56 (%6.18)	46 (%11.58)	1.808	13.42 * P>0.05
O	481 (%53)	198 (%99.8)	0.961	
Total	906	397		

Table (2) shows an increase in the frequency of IB allele in infected individuals with Covid – 19 (0.16) compared with its frequency in a healthy control (0.12).

Table (2): Comparison of the frequency of ABO blood totals for non-infected people and those infected with Coronavirus in of Al-Duloiya population

State	No. of individuals	Allele frequency		
		I^A	I^B	i
Infected	397	0.2	0.16	0.7
non-infected	906	0.19	0.12	0.72

The high frequency of AB and I^B allele in population whose infected with Covid –19 revealed that AB blood group has high incidence infected blood group. This finding was agreed with the results of the study which was done at Qatif Central Hospital in Qatif City, Saudi Arabia, which found that the AB blood group is the

most likely to be infected, among Corona patients and that the O blood group is a low incidence to be infected, i.e. there is a significant increase in the risk of coronavirus in patients with AB blood group and less risk for patients with the O blood group [3].

The results of this study were also agreed with [15] in the Indian population which showed that the individuals with AB blood group were most be infected, while individuals with O blood group had a little probability to be infected. The results of the current study disagreed with the pioneer study in Wuhan city was revealed the infection based on blood groups, their results were showed that patients with group A were more likely to be infected (37.7%) and O blood was (25.8%), so that the risk probability of infection increases in the blood group A and the risk of infection decreased in the blood group O [17], a study conducted in New York, USA, showed that the AB blood group is the lowest blood group at risk with infection (3.5%) [10]. Another study was revealed that the A blood group had more chance with both infection, and had a high rate of mortality, while mortality rate in the O blood group was decreased [1].

A survey study was done on residents of different countries of the Arab world (Iraq, Saudi Arabia, Qatar, Bahrain, UAE, Kuwait, and Oman) also showed that blood group A had the high incidence of infection, although the O blood group were common in these countries [12], another study was revealed the blood group A had the high incidence of infection in Lebanon community [9].

The results of the current study that AB blood group individuals have a higher risk of Covid-19 infection was agreed with [7]. The O blood group is more resistant to coronavirus infection while the AB blood group needs more attention to prevent infection due to the presence of A, B antigens on Red Blood Corpuscles that can act as a receptor allowing the virus to adhere and enter cells through the receptors ACE2, on the other hand, B, A antibodies that spread in the O blood group may be part of the first line of natural immunity against or reduction of viral infections. Enzymes as Angiotensin 2 (ACE2) is known as the primary receptors of coronavirus, which can be filled by the viral serine molecules by the membranous enzyme serine 2 (TMPRSS2) from the viral spike protein enzyme (S) and its abilities to restrict the host cells. Probably this events resulting hybrid structure is likely to act as a host functional bridge and nourishment [1].

Table (3) shows a significant difference between the frequency of Rh blood group phenotype between the healthy individuals and the infected, where the frequency of Rh⁻ phenotype increased in patients (21.9%) and decreased in healthy subjects (9.7%), while the frequency of Rh⁺ phenotype in healthy people increased (90.2%) and decreased in infected patients (78%).

Table (3): Observed frequency of Rh phenotype of the healthy and infected in Al-Duloiya population

Blood groups	Non-infected	Infected	RR	X^2 (1d.f)
Rh+	818 (%90.2)	310 (%78)	0.865	35.38 *
Rh-	88	87		P>0.01

	(%9.7)	(%21.9)	2.256	
total	906	397		

Table (4) shows the frequencies of Rh alleles in the healthy and infected Covid-19, the results indicate an increase in Rh⁻ allele in patients with Covid-19 virus compared to healthy individuals, with a difference between them (0.119). On the other hand, the frequency of Rh⁺ was raised in healthy individuals compared to the infected individuals, with a difference (0.129). these results indicates that individuals with Rh⁻ had a high incidence to infected with Covid - 19.

This finding in contrast to other studies, a study of [10] showed that people with Rh⁺ group are the riskiest of New Yorkers community in the United States of America. [9] showed that Rh⁺ is the most infected with the virus among Lebanese. As the results are shown in table 1 and 3, the AB⁻ blood group is most likely to be infected with Covid–19 (RR = 1.565).

Table (4): Allele frequency of Rh blood group of healthy and infected with Covid - 19 in Al-Duloiya population

category	Numbers	Allele frequency of Rh blood group	
		Rh⁻	Rh⁺
Infected	397	0.688	0.311
Non - infected	906	0.531	0.468

Table (5): Comparison between negative and positive ABO blood groups in the healthy and infected individuals with Covid - 19

Blood group	Healthy	Infected	RR
A+	205	72	0.948
A-	38	18	1.279
B+	106	51	0.962
B-	12	20	1.200
AB+	49	37	0.919
AB-	7	9	1.565

O+	**398**	**159**	**0.975**
O-	**83**	**39**	**1.414**

4. Conclusion

This study showed a positive relationship between the incidence of Covid-19 and ABO and Rh groups with blood group AB⁻ are the most likely to be infected among corona patients and O⁺ blood group are the lowest likely to be infected.

5. References

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