Original paper

Association between patients with COVID-19 and their blood groups

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Abstract

Introduction: ABO and Rh blood type systems may be related to the severity of COVID-19, according to contradictory results in several recent studies. However, the ABO and Rh blood groups' associations with COVID-19 may also vary depending on how common they are in certain populations.
Aim of the research: To explore the relationship further and give population-based data to the global scientific community, we conducted this study on participants from the Najaf Governorate.
Material and methods: The COVID-19 participants' data were gathered for this study at Al-Amal Hospital in Al-Najaf. The study comprised 533 people in general, both male and female, with varying blood types, Rh levels, and ages, from January of 2023 to March 2023.
Results and conclusions: When comparing patients based on blood group types, this study found significant differences at $p \leq 0.05$, helping to explain why the severity of COVID-19 infection varies according on blood group type. This study also revealed that, regardless of the various blood types, there are no significant differences at $p \leq 0.05$ when comparing males and females based only on sex, nor are there significant differences at $p \leq 0.05$ when comparing males based only on age and sex.

Introduction

The World Health Organisation (WHO) was advised by the China Health Authority on 31 December 2019 of many pneumonia cases in Wuhan City, Hubei Province, central China, that were of unknown cause. Since 8 December 2019, cases have been documented; however, some early cases did not have any exposure to the Huanan Seafood Wholesale Market. Many patients worked at or resided near this market [1]. On 7 January, a patient's throat swab sample revealed the presence of a novel coronavirus, which the World Health Organisation initially referred to as COVID-2019 [2]. The Coronavirus Study Group later renamed this pathogen as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [3], and the WHO named the illness coronavirus disease 2019 (COVID-19). A crisis that had never occurred in contemporary times was sparked by the COVID-19 epidemic [4]. Individual differences in the disease course are significant, ranging from a mild or even asymptomatic infection to severe illness [5].

In fact, over a million COVID-19-related deaths have been documented worldwide. Potential risk factors that influence an individual's vulnerability to infection and the course of their illness are of interest. Numerous risk factors for catastrophic outcomes, including medical (such as diabetes, hypertension) and sociodemographic (such as sex, age, race/ethnicity), have already been identified [5].

According to data, the ABO blood group – group A carrying a higher risk of illness severity and susceptibility, and group O providing protection – may also have an impact on the immunopathogenesis of SARS-CoV-2 infection [6]. Undoubtedly, COVID-19 is a grave illness that should worry the whole world. Its reproductive number is estimated to be higher than that of SARS [7]; significantly more cases of infection and deaths from COVID-19 have been documented than from SARS [8]. As with SARS-CoV and MERS-CoV, breaking the chain of transmission is thought to be essential to halting the disease's spread [9]. At the local and international levels, various strategies ought to be used in healthcare settings. Regretfully, medical environments can serve as a significant conduit for the spread of viruses. As the SARS model illustrates, triage, appropriate infection control procedures, patient isolation, and contact tracing are essential to preventing the virus from spreading further in clinics and hospitals [9].

To confine the virus and closely follow the triage protocol, suspected cases who arrive at medical institutions with signs of respiratory infections (such as runny nose, fever, and cough) must wear a face mask. They should not be allowed to wait in the facilities with other patients who are seeking medical attention. They should be put in a separate room that has adequate ventilation, at least 2 m away from other patients.

Several findings during the severe acute respiratory syndrome coronavirus (SARS-CoV-1) epidemic indicated that ABO type may be a factor in the disease, with

group O persons being less susceptible [10]. Although there is strong evidence linking an ABO blood type to an increased chance of developing COVID-19 disease or a worsening of the disease, its practical implications are uncertain [11, 12].

Aim of the research

Recent studies have investigated the association between the blood type systems (ABO and Rh) and the severity of the coronavirus disease 2019 (COVID-19), with a range of results. However, because the prevalence of the Rh and ABO blood groups varies among populations, we completed this study with participants from the Najaf governorate to explore the association further and provide population-based data to the global scientific community.

Material and methods

Patients

Five hundred blood samples were obtained from patients at Al Amal Hospital between January 2023 and March 2023. The samples were obtained by specialists that work in the laboratory for communicable diseases, and the same specialists inspected the samples before data were gathered. Tests for blood groups via the slide method. To find out whether you are presently infected with the virus that causes coronavirus illness 2019 (COVID-19), diagnostic testing for COVID-19 is done. These tests have been approved by the US Food and Drug Administration (FDA) for the diagnosis of COVID-19:

1. The RT-PCR assay. This COVID-19 test, also known as a molecular test, uses a method in the lab known as reverse transcription polymerase chain reaction (RTPCR) to find the genetic material of the virus.
2. Test for antigen. The COVID-19 test detects certain proteins of the virus. There are antigen tests that can yield results in minutes using a long nose swab and a fluid sample. These are sent to a laboratory for analysis.

Table 1. Distribution of blood groups in total sample

Blood groups	No.	%	*P*-value
B+	185	35.04	0.013*
B–	57	10.80	
A+	109	20.64	
A–	45	8.52	
O+	58	10.98	
O–	26	4.92	
AB+	37	7.01	
AB–	11	2.08	
Total	528	100	

**Significant differences at $p \leq 0.05$, one-sample t-test.*

Table 2. Distribution of blood groups with respect to gender

Blood groups	Females		Males		*P*-value
	No.	%	No.	%	
B+	106	34.30	79	36.07	0.915NS*
B–	35	11.33	22	10.05	
A+	63	20.39	46	21.00	
A–	23	7.44	22	10.05	
O+	33	10.68	25	11.42	
O–	19	6.15	7	3.20	
AB+	22	7.12	15	6.85	
AB–	8	2.59	3	1.37	
Total	309	100.00	219	100.00	

**Non-significant differences at $p \leq 0.05$ between males and females, χ^2 test.*

Statistical analysis

After performing statistical analysis on the collected data, along with setting up, analysing, and laying out the data, important insights about differences in the parameters under scrutiny and the differences of the groups in study were obtained. These are dealt with in more detail in the following sections.

Results

Comparison based on distribution of blood groups in the total sample

The results showed significant differences at $p \leq 0.05$ in the blood group of patients infected with the Covid-19 virus according to types of blood groups (Table 1).

Comparison of blood groups with respect to gender

The results showed no significant differences at $p \leq 0.05$ in the distribution of blood groups with respect to the gender of patients infected with the COVID-19 virus (Table 2).

Distribution of blood groups with respect to age groups in male patients

The results also showed no significant differences at $p \leq 0.05$ in the distribution of blood groups with respect to the age groups of male patients infected with the COVID-19 virus (Table 3).

Distribution of blood groups with respect to age groups of female patients

The results also showed no significant differences at $p \leq 0.05$ in the distribution of blood groups with

Table 3. Distribution of blood groups with respect to age groups of male patients

Blood groups	Age groups							
	15 years and less		16–30 years		31–60 years		More than 60 years	
	No.	%	No.	%	No.	%	No.	%
B+	13	41.94	24	48.98	21	36.21	21	25.93
B–	3	9.68	3	6.12	7	12.07	9	11.11
A+	7	22.58	11	22.45	10	17.24	18	22.22
A–	2	6.45	1	2.04	5	8.62	14	17.28
O+	3	9.68	6	12.24	6	10.34	10	12.35
O–	1	3.23	1	2.04	2	3.45	3	3.70
AB+	2	6.45	3	6.12	5	8.62	5	6.17
AB–	0	0.00	0	0.00	2	3.45	1	1.23
P-value	0.685NS*							

**Non-significant differences at $p \leq 0.05$ between age groups of males, χ^2.*

Table 4. Distribution of blood groups with respect to age groups of female patients

Blood groups	Age groups							
	15 years and less		16–30 years		31–60 years		More than 60 years	
	No.	%	No.	%	No.	%	No.	%
B+	11	35.48	22	44.90	20	24.69	53	35.81
B–	4	12.90	6	12.24	10	12.35	15	10.14
A+	7	22.58	7	14.29	20	24.69	29	19.59
A–	3	9.68	4	8.16	7	8.64	9	6.08
O+	3	9.68	4	8.16	8	9.88	18	12.16
O–	1	3.23	2	4.08	6	7.41	10	6.76
AB+	2	6.45	3	6.12	7	8.64	10	6.76
AB–	0	0.00	1	2.04	3	3.70	4	2.70
P-value	0.533NS*							

**Non-significant differences at $p \leq 0.05$ between age groups of females, χ^2 test.*

respect to age groups of female patients infected with the COVID-19 virus (Table 4).

Discussion

Comparison based on distribution of blood groups in the total sample

The results in this study showed significant differences at $p \leq 0.05$ in groups of patients infected with the COVID-19 virus according to type of blood group, suggesting that the distribution of blood groups may have an impact on the susceptibility to COVID-19 or the severity of the disease. This agrees with Wu *et al*., 2023 [13], who showed that blood group A has a direct impact on viral infection and that blood group A people may be more susceptible to SARS-CoV-2 due to direct blood group A antigen interaction. Research has also found a connection between COVID-19 and the Rhesus blood type (such as Rh D). According to one study, people positive for Rh-D had a greater risk of testing positive for SARS-CoV-2 [14]. Significant correlations between group B, Rh-D blood group status, and SARS were discovered in another study [15].

Comparison of blood groups with respect to gender

The results showed no significant differences at $p \leq 0.05$ in distribution of blood groups with respect to the gender of patients infected with the COVID-19 virus. There were no significant differences in the blood group distribution between male and female COVID-19 patients, sugesting that gender

has no significant impact on the distribution of blood groups among COVID-19 patients. It is important to remember that research on the effects of blood types on COVID-19 susceptibility, severity, and mortality is currently ongoing, and new discoveries may surface as additional data become available. This supports the findings of Ad'hiah *et al*., 2020 [16], who indicated that there was no significant difference in the mean age of patients between males and females.

Distribution of blood groups with respect to age groups of males patients

The results also showed no significant differences at $p \leq 0.05$ in the distribution of blood groups among different age groups of male patients infected with the COVID-19 virus. This indicates that age does not have a substantial impact on the distribution of blood groups among male individuals with COVID-19. It is crucial to remember that research on the effects of blood types on COVID-19 susceptibility, severity, and mortality is currently ongoing, and additional findings may be made as more information becomes accessible. That study, however, did not find any significant differences in the distribution of blood groups among male COVID-19 patients among age groups, indicating that age is not important in the severity of COVID-19 [17]. According to Kushwaha *et al*. (2021) [18], females had a higher risk of having COVID-19, and their rate of recovery was also significantly greater than that of males.

Distribution of blood groups with respect to age groups of females patients

The results also showed no significant differences at $p \leq 0.05$ in the distribution of blood groups with respect to age groups of females patients infected with the COVID-19 virus. This shows that among female COVID-19 patients, age is not a major factor in determining blood group distribution. It is important to remember that research on the effects of blood types on COVID-19 susceptibility, severity, and mortality is currently continuing, and additional findings may be made as more information becomes available. Nevertheless, if the study did not identify any significant differences in the distribution of blood groups among different age groups of female COVID-19 patients, it implies that age is not a significant factor in this aspect of COVID-19 biology. Raimondi *et al*. (2021) [19] demonstrated that women who are hospitalised had a lower chance of dying from COVID-19. However, once serious disease sets in, the risk of mortality becomes comparable to that of men. Additional research is required to investigate the impact of gender on the clinical progression and outcome of COVID-19.

Conclusions

This study found a significant correlation between the distribution of ABO blood groups and the severity of COVID-19. More research is needed to determine the role of ABO blood groups in SARS-CoV-2 infectivity and COVID-19 disease severity, but mounting evidence suggests that the ABO blood type may contribute to disease biology at biochemical and physiological levels. Blood type B patients are more susceptible to SARS-CoV-2 infection, whereas type O patients are less likely to get severe infection from SARS-CoV-2.

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Ethical approval

Not applicable.

Conflict of interest

The authors declare no conflict of interest.

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