The Relationship of Blood Group (ABO) in Patients Infected With SARS-COV-2.

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Abstract

Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) is a highly infectious pathogen that continues to cause substantial global morbidity and mortality. This cross-sectional study evaluated 100 confirmed COVID-19 patients admitted to the Epidemiological Monitoring Unit at the Emergency Department of Baqubah Teaching Hospital, Diyala Province, beween December 1, 2021, and January 31, 2022. The cohort included 66 males and 34 females, aged 20-80 years. Laboratory testing confirmed diagnoses, and blood samples were analyzed to determine ABO blood group distribution. Findings revealed that 25.6% of patients tested positive, with a recovery rate of 69.99% and a mortality rate of 4.41%. Males represented 70% of cases, with the highest prevalence (30%) observed among individuals aged 60–80 years. Most cases (78%) originated from the Baqubah district. The predominant symptoms were fever (88%), shortness of breath (80%), and headache (81%). Regarding blood group distribution, O+ was most frequent (26%), followed by A+ (21%), AB+ (16%), and B+ (13%). A high infection rate (46.3%) was recorded among males aged 60–80 years, with fever, cough, and dyspnea as the main clinical manifestations. The results suggest that blood groups O+ and A+ may be associated with increased susceptibility to COVID-19 infection.

Keywords: COVID-19, SARS-CoV-2, ABO blood groups.

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1. Introduction

A serious threat to human life, Coronavirus Disease 2019 (COVID-19) is a highly contagious respiratory disease brought on by the new Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). By February 20, 2021, the virus had killed about 2.45 million people worldwide and infected over 110.7 million people [1]. The Orthocoronavirinae subfamily includes the enveloped, non-segmented, positive-sense RNA virus known as SARS-CoV-2. It is characterized by a diameter of 65–125 nm, RNA strands, and crown-like spikes. The virus primarily spreads through respiratory droplets produced during activities like coughing, sneezing, or talking [2].

The differences across human populations contribute to one of the reasons for differences in the ABO blood group system, potentially due to migration and selective advantages against certain pathogens. Group O is considered the most prevalent globally and may have conferred protection against malaria. However, individuals with group O blood are at a higher risk of severe cholera [3]. Blood type O may provide some protection, whereas blood type A may be linked to increased chances of serious illness, according to preliminary research on ABO blood types and COVID-

19 results. Nevertheless, the results have been mixed, which need for greater investigation. This refer to that blood type O may be less likely to contract COVID-19 than blood type A [4], [5], [6], and [7]. This study aims to detect the distribution of SARS-CoV-2 infection in patients with respiratory symptoms using reverse transcriptase polymerase chain reaction (RT-PCR) in Diyala Province, to research the relationship between COVID-19 infection and blood group type and to examine the association of SARS-CoV-2 infection with patient demographic and clinical data.

2. Materials and Methods

The samples 100 confirmed with COVID-19 patients was carried out across-sectional investigation on them, who were admitted to the Epidemiological Monitoring Unit in the Emergency Department of Baqubah Teaching Hospital, Diyala Province, between December 1, 2021, and January 31, 2022. The participants included 34 females and 66 males, ranging in age from 20 to 80 years. The diagnosis of COVID-19 infection was verified through clinical assessment and confirmed using reverse transcriptase polymerase chain reaction (RT-PCR).

Approximately 2 mL of blood was drawn using a 5mL syringe and transferred into EDTA-containing tubes for subsequent laboratory analysis Venous Blood samples were obtained from patients with confirmed COVID-19 infection during the study period. Determination of blood groups was conducted with the aid of Anti-A, Anti-B, and Anti-A+B monoclonal antibodies, employing a commercial grouping kit (Cat. No. abx575393, SPINREACT, SA, Spain). the Statistical Analysis System (SAS, 2012) was carried out using as the data analysis. The chi-square test was applied to evaluate the study parameters.

3. Results

3.1 COVID-19 Fatality Rate and Infection Proportion

The study represents the death rate and infection distribution among 5,261 patients at Baqubah Teaching Hospital through the specified study period. Out of the total, 2,435 (46.30%) patients tested positive for COVID-19, while 2,826 (53.70%) tested negative, as displayed in Fig. 1.

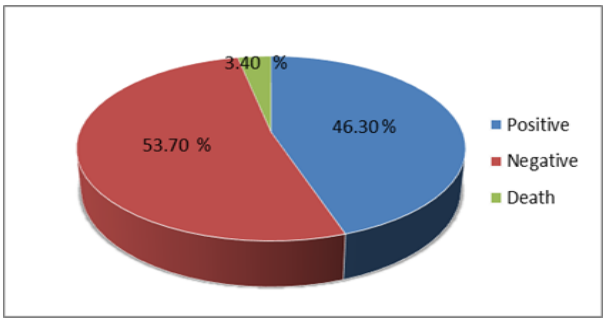

Fig. 1 Distribution of COVID-19 Patients

3.2 Demographic and Clinical Findings

For this research, samples from 100 COVID-19 patients were selected including a detailed analysis; 66% were males, and 34% were females (based on the patients' consent). The majority of patients were aged 60–80 years. Clinical symptoms varied significantly, with fever (88%), headache (81%), and shortness of breath (80%) being the most common symptoms.

3.3 ABO Blood Group Distribution

Blood group distribution among COVID-19-positive patients showed a higher frequency of group O+ (26%) and A+ (21%), followed by AB+ (16%) and B+ (13%). There were 100 patients in total who tested positive for Covid-19, of which 70 (70%) were men and 30 (30%) were women, Table 1.

Table 1: Study Population Distribution According to Gender

Gender	Patients No. (%)
Males.	70 (70 %)
Females.	30 (30 %)
Total.	100 (100%)

Based on age, patients were divided into three groups: the minimum group consisted of patients under 20 years old, the maximum group of patients over 80 years old, and the median group of patients was 40 years old. The age group 60-80 years old had the largest percentage of patients (41%), followed by the 40-60 years old (36%), and the 20-40 years old (23%), who had the lowest rate, Table 2.

Table 2: Population Distribution in the Study by Age

Age groups (Years)	Patients No. (%)
20_40	23 (23 %)
40_60	36 (36 %)
60_80	41(41 %)
Total	100 (100%)

Subjected study participants were categorized into two groups based on the individual's residency criteria with positive SARS-COV-2 results: 78 (78%) were from the Baqubah district, and 22 (22%) were from the area around the Baqubah district (Muqdadiyah, Khanaqin, Balderoz, and Al-Khalis), as shown in Table 3.

Table 3: Study Population Distribution According to Residence

Residence	Patients No. (%)
Baqubah	78 (78 %)
Around Baqubah	22 (22 %)
Total	100 (100%)

Table 4: Clinical Characteristics of Patients with Severe Respiratory Syndrome Coronavirus

Clinical signs		Patients No (%)
Fever	Yes	88 (88 **%**)
	No	22 (22 %)
Headache	Yes	81 (81 %)
	No	19 (19 %)
Cough	Productive	78 (78 %)
	Dry	22 (22 %)
Shortness of breath	Yes	80 (80 %)
	No	20 (20 %)
Diarrhea	Yes	10 (10 %)
	No	90 (90 %)
Loss of smell and tasting	Yes	13 (13 %)
	No	87 (87 %)
Myalsia	Yes	3 (3 %)
	No	97 (97 %)
Vomiting	Yes	23 (23 %)
	No	77 (77 %)

According to clinical features, patients with (+ve) SARS-CoV-2, 88 (88 %) of patients were suffering from fever, 81(81 %) headache, and 78 (78 %) productive cough and 80(80%) of patients had a shortness of breath and 23(23%) had vomiting as shown in Table 4 [8].

Regarding the type of blood groups, the patients with positive SARS-COV-2, the high frequency 26 cases and 21 cases were recorded in patients who had blood types O+ and A+ group respectively, where the percentage was close, followed by patients with blood type AB+ 16(16 %) and low frequency 13 (13 %) was noticed in patients with blood group type B+, Table 5.

Table 5: Distribution of Study Population According to Type of Blood Group

Blood group		Patients No (%)
A	Rh+	21 (21 %)
	Rh-	7 (7 %)
B	Rh+	13 (13%)
	Rh-	6 (6 %)
AB	Rh+	16 (16%)
	Rh-	2 (2 %)
O	Rh+	26 (26 %)
	Rh-	9 (9 %)
Total	100(100%)	

Based on the result of the current study, the total number (46.30%) was positive for COVID-19. while the remaining (53.70%) were negative, as shown in Fig. 1. This finding is analogous to the findings of a study conducted by Nikpouraghdam et al. [9] found that 23.06% (2968 out of 12870) were positive for SARS-COV-2 and fatality rate was 1.85% using real time-polymerase chain reaction among patients admitted to emergency department in Tehran - Iran. The rate of. SARS-COV-2 infection in this study is high compared with data of several studies conducted in different cities, using real-time polymerase chain reaction as a diagnostic method, such as the study of Hussein et al. [10], who report that 0.7% (452 out of 64591) in the Kurdistan Region.

Table 1 displays the gender distribution, with 70 (70%) more males than females (30%). This conclusion is consistent with findings from several studies conducted in nearby nations, including four investigations conducted in Saudi Arabia by Al-Omari et al. [11], who state that 80% of verified cases were male. However, the current study's findings conflicted with those of a recent study conducted by Lee et al. [12], which discovered that, out of 632 confirmed SARS-CoV-2 cases, 430

infected females accounted for more than half of all confirmed cases in South Korea.

Table 2 indicates notable variations in fatality rates across different age categories. A previous study reported that older persons are more prone to developing more severe disease [13]. Another previous study found that the case-fatality rate for patients between the ages of 70 and 79 was 8.0%, compared to 14.8% for patients 80 years of age and above [19]. This outcome could lead to reduced innate and adaptive immune activity, which is linked to aging [14, 15]. The body can defend itself against viral and other infections as we mature [16].

According to residence as shown in Table 3, this is related to the fact that the study was conducted in a hospital that was situated in the heart of the Diyala Province, and the results are similar to study conducted in by Moradzadeh et al. [17] which discovered that the infection rates in different regions of Markazi Province vary from one another, with the highest infection rate in Delijan being 575.35 per 100,000 Iranians.

In terms of infection severity, 24 cases with positive SARS-CoV-2 were classified as severe, 43 as moderate, and 33 as mild. These results agreed with other previous studies done in Saudi Arabia, which showed that the majority of hospitalized patients were linked to SARS-COV-2(18). This study found that among 99 hospitalized SARS-COV-2 patients in Saudi Arabia, fever accounted for 67.7% of clinical signs, cough for 60.6%, dyspnea for 43.4%, upper respiratory symptoms for 27.3%, fatigue for 26.3%, diarrhea for 19.2%, and loss of smell for 9.1% (18).

Blood group types O+ and A+, which accounted for 26 and 21 instances, respectively, were more likely to be present in patients with positive COVID-19, as shown in Table 5. These findings concur with those of several investigations carried out in various nations, including Li et al. [19], who showed that SARS-COV-2.

Natural human anti-A antibodies may offer protection by blocking the interaction between SARS-CoV and its receptor, according to Guillon et al. (20). This may help explain why individuals with blood group O+ were not as susceptible to SARS-CoV infection as those with blood group A.

5. Conclusions

The SARS-COV-2 infection rate was 46.3%, while the case fatality rate was 3.40%. Males accounted for 70% of the SARS-COV-2 infections, with the age range 60-80 years old accounting for 41% of cases. The majority of these cases were reported from Baqubah 78 (78). Patients with positive SARS-CoV-2 had higher rates of fever (88%), headache (81%), cough (78%), shortness of breath (80%), and loss of taste and smell (13%), among other clinical characteristics. The majority of Covid-19 patients (n = 26) and cases (n = 21) have blood types O and A.

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References

[1] Cramer, E. Y., Huang, Y., Wang, Y., Ray, E. L., Cornell, M., Bracher, J., Brennen, A., Rivadeneira, A. J., Gerding, A., House, K., & Jayawardena, D. (2022). The United States COVID-19 forecast hub dataset. *Scientific Data,* *9*(1), 462. https://doi.org/10.1038/s41597-022-01517-w

[2] Ul Qamar, M. T., Alqahtani, S. M., Alamri, M. A., & Chen, L. L. (2020). Structural basis of SARS-CoV-2 3CLpro and anti-COVID-19 drug discovery from medicinal plants. Journal of Pharmaceutical Analysis, 10(4), 313–319. https://doi.org/10.1016/j.jpha.2020.03.009.

[3] Polatoğlu, I., Oncu-Oner, T., Dalman, I., & Ozdogan, S. (2023). COVID-19 in early 2023: Structure, replication mechanism, variants of SARS-CoV-2, diagnostic tests, and vaccine & drug development studies. MedComm, 4(2), e228. https://doi.org/10.1002/mco2.228

[4] Shereen, M. A., Khan, S., Kazmi, A., Bashir, N., & Siddique, R. (2020). COVID-19 infection: Emergence, transmission, and characteristics of human coronaviruses. Journal of Advanced Research, 24, 91–98. https://doi.org/10.1016/j.jare.2020.03.005

[5] Muniz-Diaz, E., Llopis, J., Parra, R., Roig, I., Ferrer, G., Grifols, J., Millan, A., Ene, G., Ramiro, L., Maglio, L., & Garcia, N. (2021). Relationship between the ABO blood group and COVID-19 susceptibility, severity, and mortality in two cohorts of patients. Blood Transfusion, 19(1), 54. https://doi.org/10.2450/2020.0256-20.

[6] Zhang, Y., Garner, R., Salehi, S., La Rocca, M., & Duncan, D. (2021). Association between ABO blood types and coronavirus disease 2019 (COVID-19), genetic associations, and underlying molecular mechanisms: A literature review of 23 studies. Annals of Hematology, 100, 1123–1132. https://doi.org/10.1007/s00277-021-04489-w.

[7] Wu, B. B., Gu, D. Z., Yu, J. N., Yang, J., & Shen, W. Q. (2020). Association between ABO blood groups and COVID-19 infection, severity, and demise: A systematic review and meta-analysis. Infection, Genetics and Evolution, 84, 104485. https://doi.org/10.1016/j.meegid.2020.104485.

[8] Zhou, L., Ayeh, S. K., Chidambaram, V., & Karakousis, P. C. (2021). Modes of transmission of SARS-CoV-2 and evidence for preventive behavioral interventions. BMC Infectious Diseases, 21(1), 1–9. https://doi.org/10.1186/s12879-021-06222-4.

[9] Nikpouraghdam, M., Farahani, A. J., Alishiri, G., Heydari, S., Ebrahimnia, M., Samadinia, H., Sepandi, M., Jafari, N. J., Izadi, M., Qazvini, A., & Dorostkar, R. (2020). Epidemiological characteristics of coronavirus disease 2019 (COVID-19) patients in Iran: A single center study. Journal of Clinical Virology, 127, 104378. https://doi.org/10.1016/j.jcv.2020.104378.

[10] Hussein, N. R., Naqid, I. A., & Saleem, Z. S. (2020). A retrospective descriptive study characterizing coronavirus disease epidemiology among people in the Kurdistan Region, Iraq. Mediterranean Journal of Hematology and Infectious Diseases, 12(1). https://doi.org/10.4084/MJHID.2020.061.

[11] Al-Omari, A., Alhuqbani, W. N., Zaidi, A. R., Al-Subaie, M. F., AlHindi, A. M., Abogosh, A. K., Alrasheed, A. K., Alsharafi, A. A., Alhuqbani, M. N., Salih, S., & Alhedaithy, M. A. (2020). Clinical characteristics of non-intensive care unit COVID-19 patients in Saudi Arabia: A descriptive cross-sectional study. Journal of Infection and Public Health, 13(11), 1639–1644. https://doi.org/10.1016/j.jiph.2020.09.003.

[12] Lee, Y. H., Hong, C. M., Kim, D. H., Lee, T. H., & Lee, J. (2020). Clinical course of asymptomatic and mildly symptomatic patients with coronavirus disease admitted to community treatment centers, South Korea. Emerging Infectious Diseases, 26(10), 2346. https://doi.org/10.3201/eid2610.201620.

[13] Xue, Q. L. (2020). Frailty as an integrative marker of physiological vulnerability in the era of COVID-19. BMC Medicine, 18, 1–3. https://doi.org/10.1186/s12916-020-01809-1.

[14] Wong, C., & Goldstein, D. R. (2013). Impact of aging on antigen presentation cell function of dendritic cells. Current Opinion in Immunology, 25(4), 535–541. https://doi.org/10.1016/j.coi.2013.05.016.

[15] Golomb, L., Sagiv, A., Pateras, I. S., Maly, A., Krizhanovsky, V., Gorgoulis, V. G., Oren, M., & Ben-Yehuda, A. (2015). Age-associated inflammation connects RAS-induced senescence to stem cell dysfunction and epidermal malignancy.

Cell Death & Differentiation, 22(11), 1764–1774. https://doi.org/10.1038/cdd.2015.21.

[16] Van Deursen, J. M. (2014). The role of senescent cells in ageing. Nature, 509(7501), 439–446. https://doi.org/10.1038/nature13193

[17] Moradzadeh, R., Zamanian, M., Amini, S., Kalantari, M., & Nazari, J. (2021). Clinical characteristics and reproduction number of coronavirus disease (COVID-19) cases in Markazi Province in Iran. International Journal of Community Based Nursing and Midwifery, 9(1), 18.https://doi.org/10.30476/IJCBNM.2020.86339.1338.

[18] Barry, M., AlMohaya, A., AlHijji, A., Akkielah, L., AlRajhi, A., Almajid, F., Alsharidi, A., Al-Shahrani, F. S., Alotaibi, N. H., Alanazi, A.,and Ghonem, L. (2020). Clinical characteristics and outcome of hospitalized COVID-19 patients in a MERS-CoV endemic area. Journal of Epidemiology and Global Health, 10(3), 214. https://doi.org/10.2991/jegh.k.200806.002

[19] Li, J., Wang, X., Chen, J., Cai, Y., Deng, A.,and Yang, M. (2020). Association between ABO blood groups and risk of SARS-CoV-2 pneumonia. British Journal of Haematology, 190(1), 24. https://doi.org/10.1111/bjh.16797

[20] Guillon, P., Clément, M., Sébille, V., Rivain, J. G., Chou, C. F., Ruvoën-Clouet, N., and Le Pendu, J. (2008). Inhibition of the interaction between the SARS-CoV spike protein and its cellular receptor by anti-histo-blood group antibodies. Glycobiology, 18(12), 1085–1093. https://doi.org/10.1093/glycob/cwn093.