



CORRELATION BETWEEN ABO BLOOD GROUP SYSTEM AND COVID-19 SEVERITY IN ERBIL

Harmand A. Hama ^{1*}, Soz K. Abdullah ², Roya Rauof ², and Zanyar Othman ¹

¹Biology Education Department, Faculty of Education, Tishk International University, Erbil, Kurdistan Region, Iraq

²Independent Researcher

Article History

Received: 28.02.2023

Revised: 24.05.2023

Accepted: 25.05.2023

Communicated by: Dr. Orhan Tug

*Email address:

harmand.ali@tiu.edu.iq

*Corresponding Author



Copyright: © 2023 by the author.

Licensee Tishk International University, Erbil, Iraq. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution-Noncommercial 2.0 Generic License (CC BY-NC 2.0)

<https://creativecommons.org/licenses/by-nc/2.0/>

Abstract:

The incidence of SARS-CoV-2, or severe acute respiratory syndrome, can differ considerably, implying that personal characteristics affect how a disease grows. The aims to demonstrate a relationship between Kurdish patients' ABO blood groups and the severity of COVID-19. The study evaluated 300 COVID-19 patients who visited Rzgary Hospital and Zheen International Hospital in Erbil between April 2020 and December 2020, and collected data on age, gender, disease severity, and ABO blood groups. The chi-square statistic applied to examine the frequency and correlation of blood groups, and It was determined the odds ratios (ORs) and 95% confidence intervals (CIs). for severe and non-severe cases. The study included 186 males and 114 females aged 10 to 87 years old, and the blood groups frequencies A, O, B, and AB were 33.7%, 32.3%, 21.7%, and 12.3%, respectively. The study found no significant difference in COVID-19 severity for ABO blood groups A, O, B, and AB. Although there was a minor to moderate correlation between ABO blood group and COVID-19 severity, the chi-square analysis found that it was not statistically significant (p-value = 0.304). The odds ratios and 95% CIs for A, O, B, and AB blood types were 0.560 (0.256-1.224), 0.520 (0.236-1.114), 0.934 (0.436-2.00), and 0.768 (0.337-1.749), respectively.

Keywords: ABO Blood Group; COVID-19; Clinical Trials; Kurdistan

1. Introduction

The coronavirus disease 2019, , also known as COVID-19 is caused by a novel coronavirus called SARS-CoV-2 [1].The severity of the COVID-19 disease is extremely variable. This is what suggests that host factors must be having great impact on the outcomes including age, weight, and smoking history a. Moreover, various hereditary variables are also very likely to play a part or a role in the affected host's thromboinflammatory response [2].

The well-known the blood grouping system referred to as ABO is very frequently investigated within the scope of medical treatment. This is because it is the most extensively studied erythrocyte antigen system and is also known to be the most easily accessible factor that is present in an individual's genome [3]. The earliest recognized blood groups were the antigens of the human blood's ABO system, and they were also the first ever human genetic markers to be discovered [4]. In addition, the ABO blood group system has already been known to have link with a variety of different bacterial and viral

infections including helicobacter pylori norovirus, HBV, SARS-COV, and MERS-COV [5]. Current findings has shown a connection between the ABO blood types and disease risk, particularly COVID-19, which has been determined to be a concern [6]. Furthermore, when the COVID-19 virus emerged, Chinese patients have shown evidence of a possible association between ABO blood types and COVID-19 predisposition [5, 7]. However, in the Kurdistan Region there is a lack of evidence suggesting that a link exists between the COVID-19 disease and ABO blood groups. Understanding the contributing factors to the severity of COVID-19 can provide valuable insights for effective management and targeted interventions. The evidence from conducted studies in different populations suggests a potential association between ABO blood groups and COVID-19 severity, but the relationship remains to be explored in specific regional contexts. Consequently, our hypothesis postulates that individuals with certain ABO blood groups (A, B, AB, or O) have a higher likelihood of experiencing severe COVID-19 symptoms compared to individuals with other blood groups.

2. Methodology

2.1 Study Area and Data Collection

The study was carried out in Erbil, the capital of the Kurdistan region located in northern Iraq. A purposive sampling strategy was used to choose the study sample from COVID-19 patients who visited Rzgary Hospital and Zheen International Hospital in Erbil between April 2020, and December 2020. The data of a total of 300 patients was collected, most of which had a severe COVID-19 disease progression.

2.1 Data Analysis

The following parameters were analyzed statistically to find significant differences amongst the data:

1. Demographic information such as Age and Gender of the patients based on frequency and percentage of severe COVID-19.
2. The relative frequency of different blood groups in severe cases of COVID-19 compared to their frequency in the overall population.
3. A more specific analysis was carried out for each of the four ABO blood groups, focusing on the diseases that demonstrated a difference in the initial analysis.
4. Data analysis was done using IBM SPSS Statistics (version 19.0) program. Chi-square analysis and frequency analysis were employed to discover associations. The frequency of the ABO blood group in each population was used to generate odds ratios (ORs) with 95% confidence intervals (CIs). $p \leq 0.05$ was used as the significance value.

3. Findings and Discussion

The study has involved 300 patients who were diagnosed at the Rzgary Hospital and Zheen International Hospital. The patients were hospitalized between the months of April 2020 to December 2020. Among the patients male showed a higher prevalence in the patient cohort, with 186 male patients compared to 114 female patients, with a ratio of 1.63:1 with age range between 10 and 87 years old, with a mean age of 45.5 years, as indicated in Table 1. Regarding to the severity of COVID-19, the collected data showed 189 severe cases, amongst 68 with O blood group, 59 with A, 41 with B, and 21 patient with AB, moreover, 111 non-sever cases as shown in Figure 1. Moreover, with performing the combined association analysis among ABO blood group and COVID-19, we have observed statistically no significant difference in ABO blood groups and COVID-19 infection as for A ($P = 0.146$, $OR = 0.560$, $95\% CI = 0.256-1.224$), for O blood group ($P = 0.308$, $OR = 0.520$ % $CI =$

(0.236-1.114), for B and AB (P=0.861, OR = 0.934, 95% CI = 0.436-2.00; and P = 0.530, OR = 0.768 , 95% CI = 0.337- 1.749, respectively) Table 2. Besides, the chi-square analysis has shown minor to moderate connection between ABO blood group and intensity of COVID-19 and Phi value= 0.110. However, statistically no significant has been found as the P value= 0.304 in chi square analysis as indicated at Table 3.

Table 1: The frequency and percentage of severe COVID-19 cases based on gender and age groups.

Gender	Frequency	Percentage
Male	186	62.00
Female	114	38.00
Age		
10-20	9	3.00
21-30	46	15.33
31-40	85	28.33
41-50	50	16.66
51-60	50	16.66
61-70	44	14.66
70>	16	5.33

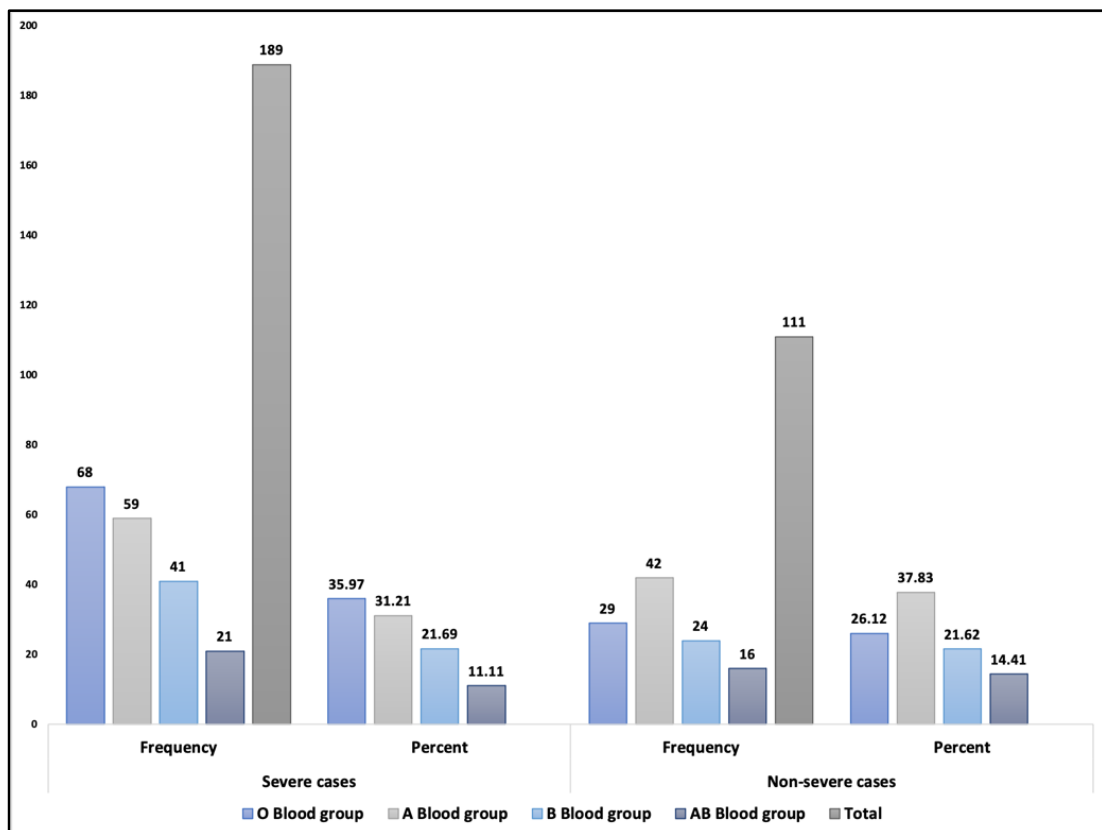


Figure 1: The Frequency and percentage of ABO blood groups among severe and non-severe COVID-19 cases.

Table 2: Association examination of ABO blood type between severe and non-severe COVID-19 cases.

Blood groups	Severe cases	Non-severe cases	OR (95% CI)	Significance (P-value)
O	68	29	0.520 (0.236-1.114)	0.308
A	59	42	0.560 (0.256-1.224)	0.146
B	41	24	0.934 (0.436-2.00)	0.861
AB	21	16	0.768 (0.337- 1.749)	0.530

OR; Odds ratio after adjustment, CI; Confidence Interval.

Table 3: The correlation analysis between COVID-19 severity and ABO blood groups.

Chi-Square Tests	Value	df	Asymp. Sig. (2-sided)	Symmetric Measures	Value
Pearson Chi-Square	3.629 ^a	3	.304	Nominal by Nominal Phi	.110
Likelihood Ratio	3.669	3	.299	Cramer's V	.110
Linear-by-Linear Association	1.846	1	.174	N of Valid Cases	300
N of Valid Cases	300				
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 13.69.					

4. Discussion

The coronavirus disease 2019, also known as COVID-19 is caused by a novel coronavirus called SARS-CoV-2 [1]. The severity of the COVID-19 disease is extremely variable. This is what suggests that host factors must be having great impact on the outcomes including age, weight, and smoking history a. Moreover, various hereditary variables are also very likely to play a part or a role in the affected host's thromboinflammatory response [2].

The well-known the blood grouping system referred to as ABO is very frequently investigated within the scope of medical treatment. This is because it is the most extensively studied erythrocyte antigen system and is also known to be the most easily accessible factor that is present in an individual's genome [3]. The earliest recognized blood groups were the antigens of the human blood's ABO system, and they were also the first ever human genetic markers to be discovered [4]. In addition, the ABO blood group system has already been known to have link with a variety of different bacterial and viral infections including helicobacter pylori norovirus, HBV, SARS-COV, and MERS-COV [5]. Current findings has shown a connection between the ABO blood types and disease risk, particularly COVID-19, which has been determined to be a concern [6]. Furthermore, when the COVID-19 virus emerged, Chinese patients have shown evidence of a possible association between ABO blood types and COVID-19 predisposition [5, 7]. However, in the Kurdistan Region there is a lack of evidence suggesting that a link exists between the COVID-19 disease and ABO blood groups. Understanding the contributing factors to the severity of COVID-19 can provide valuable insights for effective management and targeted interventions. The evidence from conducted studies in different populations suggests a potential association between ABO blood groups and COVID-19 severity, but the relationship remains to be explored in specific regional contexts. Consequently, our hypothesis

postulates that individuals with certain ABO blood groups (A, B, AB, or O) have a higher likelihood of experiencing severe COVID-19 symptoms compared to individuals with other blood groups.

5. Conclusion

Thus, according our analysis, patients in Erbil with blood group A are more likely to contract COVID-19. Also, it can be said that there is statistically no correlation between the COVID-19 severity of the patients and their ABO blood group. Nonetheless, our findings indicated that blood type B people had the highest probability of experiencing severe symptoms. Nevertheless, there weren't enough patients with blood group B to provide a statistically meaningful result. This recommends researches with larger sample sizes are required to corroborate our findings and reveal a meaningful existing link and outcome.

6. Author's Contribution

All authors have contributed in preparing the current manuscript as the following, Harmand A. Hama; Conceptualization, methodology, formal analysis, data curation, visualization and writing original draft preparation. Roya Rauf data processing, investigation, methodology. Soz K. Abdullah and Zanyar Othman review and editing.

7. Conflict of Interest

The authors declare that they have no conflicts of interest.

8. Acknowledgment

The authors acknowledge the outstanding services rendered by Rizgary Hospital which they have offered to the patients during the pandemic and still they do, and to support the researchers for providing the data and being helpful.

References

- [1] Merza MY, Hwaiz RA, Hamad BK, Mohammad KA, Hama HA, Karim AY. Analysis of cytokines in SARS-CoV-2 or COVID-19 patients in Erbil city, Kurdistan Region of Iraq. *Plos one*. 2021; 16(4): e0250330. <https://doi.org/10.1371/journal.pone.0250330>
 - [2] Nalbant A, Aydın A, Yaylacı S, Kaya T, Wermeulen CL, Cinemre H. Association of ABO blood group and age with COVID-19 positive test. *Revista da Associação Médica Brasileira*. 2021; 67: 46-50. <https://doi.org/10.1590/1806-9282.67.Supp1.20200703>
 - [3] Storry J, Olsson ML. The ABO blood group system revisited: a review and update. *Immunohematology*. 2009; 25(2): 48. <https://doi.org/10.21307/immunohematology-2019-231>
 - [4] Hama HA, Hamatahir SK, Sirwan Y. Distribution of ABO Blood Groups in Acute Leukemia Patients in Sulaymaniyah, Kurdistan Region of Iraq. *Applied Biological Research*. 2022; 24(2): 119-25. <http://dx.doi.org/10.5958/0974-4517.2022.00015.5>
 - [5] Wu B-B, Gu D-Z, Yu J-N, Yang J, Shen W-Q. Association between ABO blood groups and COVID-19 infection, severity and demise: A systematic review and meta-analysis. *Infection, Genetics and Evolution*. 2020; 84: 104485. <https://doi.org/10.1016/j.meegid.2020.104485>
 - [6] Ad'hiah AH, Allami RH, Mohsin RH, Abdullah MH, AL-Sa'ady AJ, Alsudani MY. Evaluating of the association between ABO blood groups and coronavirus disease 2019
-

- (COVID-19) in Iraqi patients. *Egyptian Journal of Medical Human Genetics*. 2020; 21(1): 1-6.
- [7] El-Shitany NA, El-Hamamsy M, Alahmadi AA, Eid BG, Neamatallah T, Almkadi HS, et al. The Impact of ABO Blood Grouping on COVID-19 Vulnerability and Seriousness: A Retrospective Cross-Sectional Controlled Study among the Arab Community. *International Journal of Environmental Research and Public Health*. 2021; 18(1): 276. <https://doi.org/10.3390/ijerph18010276>
- [8] Groot HE, Villegas Sierra LE, Said MA, Lipsic E, Karper JC, van der Harst P. Genetically determined ABO blood group and its associations with health and disease. *Arteriosclerosis, thrombosis, and vascular biology*. 2020; 40(3): 830-8. <https://doi.org/10.1161/ATVBAHA.119.313658>
- [9] Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *The lancet*. 2020; 395(10223): 497-506. [https://doi.org/10.1016/S0140-6736\(20\)30183-5](https://doi.org/10.1016/S0140-6736(20)30183-5)
- [10] Wrapp D, Wang N, Corbett KS, Goldsmith JA, Hsieh C-L, Abiona O, et al. Cryo-EM structure of the 2019-nCoV spike in the prefusion conformation. *Science*. 2020; 367(6483): 1260-3. <https://doi.org/10.1126/science.abb2507>
- [11] Liu J, Zhang S, Liu M, Wang Q, Shen H, Zhang Y. Distribution of ABO/Rh blood groups and their association with hepatitis B virus infection in 3.8 million Chinese adults: a population-based cross-sectional study. *Journal of viral hepatitis*. 2018; 25(4): 401-11. <https://doi.org/10.1111/jvh.12829>
- [12] Xu H, Zhong L, Deng J, Peng J, Dan H, Zeng X, et al. High expression of ACE2 receptor of 2019-nCoV on the epithelial cells of oral mucosa. *International journal of oral science*. 2020; 12(1): 1-5. <https://doi.org/10.1038/s41368-020-0074-x>
- [13] Cao L, Goureshnik I, Coventry B, Case JB, Miller L, Kozodoy L, et al. De novo design of picomolar SARS-CoV-2 miniprotein inhibitors. *Science*. 2020; 370(6515): 426-31. <https://doi.org/10.1126/science.abd9909>
- [14] Guillon P, Clément M, Sébille V, Rivain J-G, Chou C-F, Ruvoën-Clouet N, et al. Inhibition of the interaction between the SARS-CoV spike protein and its cellular receptor by anti-histo-blood group antibodies. *Glycobiology*. 2008; 18(12): 1085-93. <https://doi.org/10.1093/glycob/cwn093>
-