Indian Journal of Clinical Anatomy and Physiology 2022;9(3):192–196

Content available at: https://www.ipinnovative.com/open-access-journals

Indian Journal of Clinical Anatomy and Physiology

Journal homepage: https://www.ijcap.org/

Original Research Article

ABO blood group relationship with COVID-19 occurrence and severity

Anurag Yadav[1,*], Ravi D Mala[2], Sri Hari Yadav Besati[3], D Padmasree[1], Golla Anmol Manaswini[4], Nanda Kumar L G[5]

[1]*Dept. of Biochemistry, MNR Medical College & Hospital, Sangareddy, Telangana, India*
[2]*Dept. of Pharmacology, MNR Medical College & Hospital, Sangareddy, Telangana, India*
[3]*Sri Venkateshwara Medical College, Tirupati, Andhra Pradesh, India*
[4]*Malla Reddy Institute of Medical Science, Hyderabad, Telangana, India*
[5]*Dept. of Physiology & Practicing Diabetologist, MNR Medical College & Hospital, Sangareddy, Telangana, India*

ARTICLE INFO

Article history:
Received 27-05-2022
Accepted 25-07-2022
Available online 10-10-2022

Keywords:
SARC CoV
COVID 19
Mortality
ABO
Blood group

ABSTRACT

Objective: Study aimed to assess the relation between the ABO blood group and occurrence of COVID-19 and severity.

Materials and Methods: This was a single centric retrospective study conducted at the MNR Medical College & Hospital among the patients admitted for COVID-19 infections during the July 25^{th} to 30^{th} October 2020. All the patients who were tested COVID-19 positive and the blood type recorded in the health care record were included in present study. The demographics, comorbidities, and the laboratory data of CBC, RBS, liver function test, renal function test, C-reactive protein, serum ferritin and D-dimmer were reviewed.

Result: Total of 365 patients are enrolled in present study (53.2% male and 45.8% female. The blood group of A was common followed with blood group O and group B. 68.5% (n=250) of the patients included had turned to be positive for COVID-19 and 31.5% (n=115) were with negative COVID-19. There was a significant higher odds of the COVID-19 among the blood group A compared to the other blood group type and blood group O had lower odds of the disease. Requirement of ventilator support was significant higher in patients with group A compared to other blood group. In present study, total of 4 patients succumbed to death.

Conclusion: There is presence of higher risk of type A blood group compared to other blood group type with susceptibility for the SARS-CoV (COVID-19) and also the severity of the progression of disease.

This is an Open Access (OA) journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprint@ipinnovative.com

1. Introduction

Since December 2019, several cases of pneumonia caused by the novel coronavirus have been found in Wuhan, Hubei Province. The WHO has officially called coronavirus disease 2019 (COVID-19).[1] The novel corona virus is linked to viruses that cause fatal acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS) diseases.[2] For the first time, Huang et al. registered 41 cases of COVID-19, most of which were contracted at the Huanan Seafood Market. Medical symptoms included fever, cough, dyspnea, myalgia, weakness, normal or reduced white blood cell count, and evidence of imaging pneumonia.[3]

There is a blood type association with rotavirus, noroviruses (NoVs), dengue virus, Norwalk virus and hepatitis B virus.[4–7] The type of human blood has been used as a genetic marker. By observing the relationship between the human blood type and the virus infection, it is possible

* *Corresponding author.*
E-mail address: yadav.anurag52@gmail.com (A. Yadav).

https://doi.org/10.18231/j.ijcap.2022.041
2394-2118/© 2022 Innovative Publication, All rights reserved.

to assess the susceptibility of people with different types of blood group to the virus. There is no evidence on the relationship between ABO blood typing and the incidence of COVID-19 disease in Indian population

The present study aimed to assess the relation between the ABO blood group and occurence of COVID-19 and severity.

2. Materials and Methods

This was a single centric retrospective study conducted at the MNR Medical College & Hospital among the patients admitted for COVID-19 infections during the July 25^{th} to 30^{th} October 2020. All the patients who were tested COVID-19 positive and the blood type recorded in the health care record were included in present study. The demographics, comorbidities, and the laboratory data of CBC, RBS, liver function test, renal function test, C-reactive protein, serum ferritin and D-dimer were reviewed. All procedures followed were in compliance with the ethical guidelines of the responsible committee for human experimentation (both institutional and national) and Helsinki Declaration of 1975 as revised in 2008. The comorbidities of interest which were analyzed as a binary variables were hypertension, smoking,[8] hyperlipidemia, COPD, history of CAD, diabetes mellitus,[9] history of cancer, chronic kidney disease, patients on dialysis[10] liver disease, thyroid disorders[11] and asthma were recorded. Admission referred to the admission which was primarily for the treatment and isolation specific to the COVID-19 infection. Death was defined as the mortality in which COVID-19 infection complications had a significant role in patient's death.

2.1. Statistical analysis

All the data were entered in excel sheet and analysed using the IBM SPSS v23 operating on windows 10. The continuous data were evaluated for the normality as determined by skewness and kurtosis. The chi-square test was used for categorical variable and student's t test was used for the continuous variables as appropriate. A p-value of <0.05 considered statistically significant.

3. Result

Total of 365 patients were enrolled in present study after obtaining the informed consent from all of them. Among them 53.2% were male patients and 45.8% were female patients, with male predominance. The blood group of A was common followed with blood group O and group B. 68.5% (n=250) of the patients included had turned to be positive for COVID-19 and 31.5% (n=115) were with negative COVID-19.(Table 1)

There was a significant higher odds of the COVID-19 among the blood group A compared to the other blood group type and blood group O had lower odds of the disease. (Table 2)

In 31.2% patients with blood group A had significant higher incidence with COVID-19, compared to 24.0% in blood group O, 27.6% in group B and 9.6% in blood group AB.(Table 3)

A significant higher incidence of requirement of ventilator support was documented in 50% of the patients with group A compared to other blood group.(Table 4)

In present study, total of 4 patients succumbed to death, and all death occurred in patients with blood group A. (Table 5)

4. Discussion

Blood group antigen expression differences can increase or decrease host susceptibility to a variety of infections. By acting as receptors and/or coreceptors for microorganisms, parasites, and viruses, blood group antigens can play a direct role in infection. Furthermore, through the organization of membrane microdomains, many blood group antigens facilitate intracellular uptake, signal transduction, or cell adhesion. Blood group antigens have the ability to alter the innate immune response to infection.[12]

Although the present study does not examine the mechanism behind the association, one possible mechanism that could be involved in the increased risk associated with the blood type A antigen is that it contains galactose as an end-group saccharide. In this position, both blood type B and O have galactose amines, which may explain the disparity between the blood types. The SARS-COV-2 spike protein has been shown to bind carbohydrates, and a close affinity between the A antigen and the virus could promote the virus' uptake in the cells.[13]

In present study, we have found a higher incidence of COVID-19 positive among the patients with blood Group A compared to other blood groups. Zhanna Kaidarova and colleagues discovered that individuals with blood groups A and D are more likely to develop severe disease outcomes following West Nile virus infection due to genetic susceptibility.[14] The presence of histo-blood group antigens (HBGA), specifically those corresponding to the ABO, secretor, and Lewis phenotypes, is largely responsible for genetic susceptibility to norovirus.[15] Rotavirus gastroenteritis was significantly more common in children with blood groups A and AB than in those with blood group O. The findings support the hypothesis that an HBGA genetic background is associated with rotavirus susceptibility.[16] Cheng et al. discovered that patients with blood group O were less susceptible to SARS-CoV infection.[17] According to Patrice et al., natural human anti-A antibodies may block the interaction between SARS-CoV and its receptor, thereby providing protection, which could explain why people with blood group A were more susceptible to SARS-CoV infection while people with blood

Table 1: Demographic details of the patients included in present study

		Frequency	Percent
Gender	Female	171	46.8
	Male	194	53.2
Blood Group	A	116	31.8
	AB	30	8.2
	B	105	28.8
	O	114	31.2
Rh	Negative	21	5.8
	Positive	344	94.2
COVID-19 Test	Absent	115	31.5
	Present	250	68.5
Ventilator support	Not required	232	63.6
	Required	18	4.9
	Total	250	68.5
Outcome	Death	2	.5
	Discharged	248	67.9
	Total	250	68.5
Hospital stay	< 7days	176	48.2
	> 7days	74	20.3
	Total	250	68.5

Table 2: Showing the odds of the occurrence of COVID-19 among the blood groups

Blood Group	OR	95% CI	Sig
A	1.845	(1.122 – 2.109	0.001**
B	1.036	0.753 – 1.475	0.71
O	0.549	(0.357 – 0.930)	0.01*
AB	0.73	0.41 – 1.215	0.30

Table 3: Comparison of the blood group with the presence of COVID-19 using chi-square test

			COVID-19		
			Negative	Positive	Chi-square (p-value)
Blood group	A	Count	38	78	7.886 (0.001**)
		% within COVID-19	33.0%	31.2%	
	AB	Count	6	24	1.22 (0.260)
		% within COVID-19	5.2%	9.6%	
	B	Count	36	69	0.152 (0.707)
		% within COVID-19	31.3%	27.6%	
	O	Count	54	60	5.611 (0.011*)
		% within COVID-19	46.9%	24.0%	

Table 4: Comparison of the blood group with requirement of ventilator support using chi-square test

			Ventilator support		Chi-sqaure (p-value)
			Not required	Required	
Blood group	A	Count	69	9	5.657 (0.03)*
		% within Ventilator support	29.7%	50.0%	
	AB	Count	21	3	
		% within Ventilator support	9.1%	16.7%	
	B	Count	67	2	
		% within Ventilator support	28.9%	11.1%	
	O	Count	75	4	
		% within Ventilator support	32.3%	22.2%	

Table 5: Comparison of the blood group with outcome of patients using chi-square test

			Outcome		Chi-square (p-value)
			Death	Discharged	
Blood group	A	Count	4	74	4.446 (0.02*)
		% within Outcome	100.0%	30.6%	
	AB	Count	0	24	
		% within Outcome	0.0%	9.7%	
	B	Count	0	69	
		% within Outcome	0.0%	27.8%	
	O	Count	0	79	
		% within Outcome	0.0%	31.9%	

group O were not.[18]

Also, there was a significant higher incidence of the patients with blood group A showing the requirement of the ventilator support during the course of disease, and 4 patients death was noted in study and all of them were with blood group A. The hospital stay of >7 days was frequently seen among the patients with blood Group A.

5. Conclusion

The current study validated the presence of higher risk of type A blood group compared to other blood group type with susceptibility for the SARS-CoV and also the severity of the progression of disease. The mortality is also higher among the patients with blood group type A. moreover, further investigations and studies are recommended to clarify and substantiate the above finding and provide better understanding at the molecular level insight related to pathogenesis and severity with blood type of patient.

6. Source of Funding

The authors state that this work has not received any funding.

7. Conflict of Interest

The authors declare that there is no conflict of interest or financial disclosure related to this publication.

References

1. Gao J, Tian Z, Yang X. Breakthrough: Chloroquine phosphate has shown apparent efficacy in treatment of COVID-19 associated pneumonia in clinical studies. *Biosci Trends*. 2020;14(1):72–3.
2. Yin Y, Wunderink RG, Mers. SARS and other coronaviruses as causes of pneumonia. *Respirology*. 2018;23(2):130–7.
3. 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. *Lancet*. 2020;395(10223):497–506.
4. Kazi AM, Cortese MM, Yu Y, Lopman B, Morrow AL, Fleming JA, et al. Secretor and Salivary ABO Blood Group Antigen Status Predict Rotavirus Vaccine Take in Infants. *J Infect Dis*. 2017;215(5):786–9.
5. Hutson AM, Atmar RL, Graham DY, Estes MK. Norwalk Virus Infection and Disease Is Associated with ABO Histo-Blood Group Type. *J Infect Dis*. 2002;185(9):1335–7.
6. Kalayanarooj S, Gibbons RV, Vaughn D, Green S, Nisalak A, Jarman RG, et al. Blood Group AB Is Associated with Increased Risk for Severe Dengue Disease in Secondary Infections. *J Infect Dis*. 2007;195(7):1014–7.
7. 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. *J Viral Hepat*. 2018;25(4):401–11.
8. Yadav A. A Correlative Study of Serum Adenosine Deaminase, Malondialdehyde, Advanced Oxidation Protein Products and Spirometric Analysis in Smokers. *Int J Adv Res*. 2020;8(02):33–40.
9. Yadav A, Yadav GAM, Kaveri NK, Kumar NLG, Yadav GSN, Babu KR. Relationship of subclinical inflammatory markers with glycemic status and duration of diabetes among rural Indian type 2 diabetic population. *Al Ameen J Med Sci*. 2022;15(1):21–6.
10. Dsouza AP, Ramlinga R, Yadav A, Mala M. Effect of Hemodialysis on Trace Elements in Renal Failure Patients. *Indian J Med Biochem*. 2019;23(2):233–5.
11. Yadav A, Yadav GAM, Narsingrao KK, Kumar NLG, Yadav GSN. Prevalence of thyroid disorders among patients with diabetes in rural South India. *Diabetes Metab Syndr Clin Res Rev*. 2021;15(3):885–9.
12. Vasavi P, Usha MK, Yadav A. Role of training session in improving the knowledge of blood transfusion practices among undergraduates: A hospital-based study. *J Pathol Nepal*. 2020;10(1):1702–5.
13. Chiodo F, Bruijns SCM, Rodriguez E, Li RJE, Molinaro A, Silipo A. Novel ACE2-Independent Carbohydrate-Binding of SARS-CoV-2 Spike Protein to Host Lectins and Lung Microbiota. *bioRxiv*. 2020;doi:10.1101/2020.05.13.092478.
14. Kaidarova Z, Bravo MD, Kamel HT, Custer BS, Busch MP, Lanteri MC. Blood group A and D negativity are associated with symptomatic West Nile virus infection. *Transfusion*. 2016;56(7):1699–706.
15. Sharma S, Hagbom M, Carlsson B, Öhd JN, Insulander M, Eriksson R, et al. Secretor Status is Associated with Susceptibility to Disease in a Large GII.6 Norovirus Foodborne Outbreak. *Food Environ Virol*. 2020;12(1):28–34.
16. Pérez-Ortín R, Vila-Vicent S, Carmona-Vicente N, Santiso-Bellón C, Rodríguez-Díaz J, Buesa J. Histo-Blood Group Antigens in Children with Symptomatic Rotavirus Infection. *Viruses*. 2019;11(4):339.
17. Cheng Y, Cheng G, Chui CH, Lau FY, Chan PKS, Ng MHL, et al. ABO blood group and susceptibility to severe acute respiratory syndrome. *JAMA*. 2005;293(12):1450–1.
18. Guillon P, Clément M, Sébille V, Rivain JG, Chou CF, 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.

Author biography

Anurag Yadav, Assistant Professor

Ravi D Mala, Associate Professor

Sri Hari Yadav Besati, MBBS Graduate

D Padmasree, Professor and Head

Golla Anmol Manaswini, Junior Resident

Nanda Kumar L G, Professor

Cite this article: Yadav A, Mala RD, Besati SHY, Padmasree D, Manaswini GA, Kumar L G N. ABO blood group relationship with COVID-19 occurrence and severity. *Indian J Clin Anat Physiol* 2022;9(3):192-196.