

THE COVID-19 VULNERABILITY IN ASSOCIATION WITH ABO AND RH BLOOD GROUP SYSTEM: AN ANALYTICAL STUDY WITH REVIEW OF LITERATURE**PRIYADARSHINI DEVENDRAPPA*, LATHA VARADHARAJ, JYOTHI ANANTHARAJ, JAYASHREE H K, PARAMITA BHOWMIK**

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ABSTRACT

Objective: COVID-19 began on March 11, 2020, when the WHO declared a pandemic, caused by the novel coronavirus. At present, millions of COVID-positive cases are reported with an increase in mortality during the second wave. There are various studies and research chronicles available regarding hematology and biochemical criteria in COVID-19 infection. On the other hand, there is an urge to explore of ABO blood group vulnerability of COVID-19-infected patients in our study population. Our aim of this study is to scrutinize the relevance between the ABO, Rh blood types, and the susceptibility to COVID-19 and to study the capable use of the ABO blood group system for risk stratification of COVID-19.

Methods: ABO and Rh grouping data available of 500 COVID-19 positive were collected from our hospital blood bank. Data about the age and gender of each patient are obtained from the Laboratory Information system. The patients who were confirmed to have SARS-CoV-2 infection by RT-PCR and ABO and Rh typing data available are included in the study.

Results: The ABO blood group in 500 people in tertiary care hospital displayed a percentage distribution of 31.8%, 27.4%, 6.4%, and 34.4% for A, B, AB, and O, respectively. The proportion of non-O blood group (A, B, and AB) among patients with COVID-19 was substantially higher compared to the O blood group.

Conclusion: This study reports an association between COVID-19 susceptibleness and the ABO blood group system. Categorically, non-O blood group systems have a greater risk compared to the O blood group system and have a higher risk of ICU admissions due to COVID-19-related complications.

Keywords: COVID-19, Blood group, Pandemic, Susceptibility.

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INTRODUCTION

The recent SARS-CoV-2 coronavirus, inciting the novel contagious disorder COVID-19, began on March 11, 2020, and the WHO announced it as a universal pandemic. There are various studies and research chronicles available regarding hematology and biochemical criterion in COVID-19 infection. On the other hand, there is an urge for exploration to criticize the ABO blood group vulnerability of COVID-19-infected patients in our study population [1].

The prevailing analytic knowledge and clinical experience recommended that in the study population, gender, age, and associated comorbidities are the risk factors in the susceptibility to COVID-19. The potentiality of blood category in anticipating endanger and complexity of COVID-19 virus has cropped up as a critical experimental query.

The current analysis enumerates the significant association between blood type and susceptibility to COVID-19. Despite this, further exploration and research studies are required to perceive the COVID-19 severity in association with the ABO blood grouping system [2,3].

The coronavirus (COVID-19) pandemic has jeopardized the lives of millions of people globally. Considering the beginning of the COVID-19 outbreak in the province of Wuhan, China, scientists have broadly scrutinized the various clinical characteristics and hazardous effects on patients with SARS-Cov-2 infection. Amidst the risk factors and predispositions in numerous infectious disorders, the study ABO blood group polymorphisms system has endured in various microorganisms [4].

MATERIALS AND METHODS**Source of data**

ABO-typed blood samples were collected from 500 patients infected with SARS-CoV-2 at the Rajarajeswari Medical College and Research Hospital blood bank in Bengaluru.

Period of study

Six months prospective study from July 2020 to December 2020.

Method of collection of data

ABO and Rh grouping data available of, 500 COVID-19 positive were collected from the blood bank. The diagnosis of COVID-19 was confirmed by a positive real-time reverse transcriptase polymerase chain reaction test of SARS-CoV-2 on nasal and pharyngeal swab specimens from patients.

Data about the age and gender of each patient are obtained from the Laboratory Information system.

Inclusion criteria

The patients who were confirmed to have SARS-CoV-2 infection by RT-PCR and ABO and Rh typing data available are included in the study. There are no restrictions on gender, age, race, or any comorbidities.

Exclusion criteria

The patients with confirmed COVID-19 positives but without the ABO and Rh typing data are excluded from the study.

Statistical analyses were performed using SPSS software.

RESULTS

A total number of COVID-19-positive patients studied were 500 out of which 288 (57.6%) were male patients and 212 (42.4%) female patients (Table 1).

The most common age group affected by COVID-19 in both male and female patients were between 30 and 60 years and higher number of cases are between 40 and 50 years.

The ABO blood group in 500 people in tertiary care hospital displayed a percentage distribution of 31.8%, 27.4%, 6.4%, and 34.4% for A, B, AB, and O, respectively (Table 2).

The proportion of non-O blood group (A, B, and AB) among patients with COVID-19 was substantially higher compared to O blood group.

A positive blood group patient was higher compared to other non-O blood groups (B and AB).

Out of 500 patients studied, 127 (25.4%) patients were admitted to the ICU with COVID-19-related complications.

Among 127 patients, 90 patients (70.86%) were Non-O blood groups (A, B, and AB) and had more COVID-19-related complications when compared to the O blood group (Table 3).

The COVID-19 risk significantly increased in A and B blood groups compared to blood group O with minimal complications (Table 4).

On the contrary, blood group A was associated with a higher risk of complications compared with non-A groups.

DISCUSSION

Thriving information proposed that the ABO and Rh blood grouping is devoted to the vulnerability of COVID-19, although the consequences are questionable. Many subjects are strikingly involved in ABO blood groups.

Susceptiveness of viral infections has constituted to be linked to ABO and Rh blood grouping system. Assorted surveys stated that ABO blood groups laid out various risks associated with SARS-CoV-2 infection, leading to COVID-19.

Precisely, Blood group A was concordant with a heightened risk though Blood group O is associated with an abating risk [5].

Latz *et al.* have shown in their studies a relationship between ABO blood groups and host perceptivity to COVID-19 disease relatively than actual consequences of blood grouping on the cruelty of the disease. The study was done by them on 7648 COVID-19-positive patients among which 40% fit into the type O blood group in comparison to 60% of non-O blood group patients. This Vulnerability may be due to ABO antibodies, which are incorporated into the innate immune system. The inherent ABH antigens have a predilection to various diseases and vulnerability to infection. They established that A and AB blood group patients required ICU admission for critical care and mechanical ventilation due to marked damage to the lung from COVID-19 [6].

Padhi *et al.* described that COVID-19 infections have divergent clinical manifestations presenting with delicate to gruesome ones. The severity depends on criteria such as age, gender, and comorbid factors.

Recent research has substantiated that the probability of COVID-19 status also builds on inherent blood group and has demonstrated that certain blood groups have reduced susceptibility to the infection and a few have higher vulnerability to the illness [7].

The novel data described the ABO blood group biological structure governing the thrombotic risk in COVID 19 due to microthrombi formation in the vascular system of the lungs [8].

Table 1: Age- and gender-wise distribution of COVID-19-positive patients

Age (in years)	Number of cases	Males	Females
1-10	10	6	04
11-20	22	9	13
21-30	80	46	34
31-40	85	53	32
41-50	108	60	48
51-60	73	41	32
61-70	84	49	35
71-80	29	18	11
>80	9	6	3
Total	500 (100%)	288 (57.6%)	212 (42.4%)

Table 2: ABO and Rh blood group distribution in COVID-19-positive male and female patients

ABO and Rh blood group	Total number of cases	Total number of males	Total number of females
A positive	152	88	64
A negative	7	5	02
B positive	125	76	49
B negative	12	7	5
AB positive	29	17	12
AB negative	03	01	02
O positive	161	87	74
O negative	11	07	4
Total	500	288	212

Table 3: ICU data of blood group distribution among COVID-19-positive male and female patients

Blood group	Total number of cases in ICU	Total number of males in ICU	Total number of females in ICU
A positive	41	29	12
A negative	02	01	01
B positive	38	23	15
B negative	05	04	01
AB positive	04	02	02
AB negative	00	00	00
O positive	33	17	16
O negative	04	02	02
Total	127	78	49

ICU: Intensive care unit

Table 4: O blood group and non-O blood group (A, B, and AB) distribution among total number of cases and ICU cases among COVID-19-positive patients

Blood group	Total no. of patients	No. of patients in ICU
Non-O blood group (A, B, and AB)	328	90 (70.86%)
O blood group	172	37 (29.14%)
Total	500	127 (100%)

Patrice *et al.* established that anti-A antibodies categorically guarded the adherence of S protein expression of SARS-COV to ACE2 receptor cell lines. The reduced susceptibleness of the O blood group and increased vulnerability of the A blood group for COVID-19 infections are perhaps associated with the presence of innate antibodies to the blood group antigens, notably anti-A antibodies demonstrated in the blood. This assumption demands sincere research to justify underlying mechanisms [9].

AbdelMassih *et al.* stated that COVID-19 is presently the sole unfavorable pandemic disclosed after the Spanish flu pandemic in

1918. SARS-CoV-2 has affected more than 31 million population and approximately 1 million deaths by September 2020. SARS-CoV-2 the agent causing COVID-19 is fatal and spread through droplet infection, culminating in acute respiratory distress [10].

The ample spectrum of clinical signs and symptoms and the erratic development of the infection have laid a powerful squeeze on health maintenance globally.

Zhao *et al.* stated that prevailing scientific surveillance advocated that the elderly age and males are more vulnerable to COVID-19 disease and also progress further to severe infection [11].

ABO blood group susceptibility to viral diseases has been established and disclosed that fewer people with O blood group and more people with "A" blood group were affected by SARS-CoV-2 infection.

Zhao *et al.* recommended that blood group A is pertinent to the unfavorable events while O blood group is associated with moderate symptoms. In his study, more than 75% of the affected patients belonged to the non-O blood group persons although only 25% be linked with the O blood group [12].

Various research works have been done to assess the benefits of serum markers as the severity indicators of SARS-CoV-2 infection. The array of studies includes basic modest investigations such as ferritin, C-reactive protein, and D-dimer levels. ABO blood grouping system is economical and has been considered a striking objective of this approach and is easily accessible in the descriptive testimony of the individuals [13].

The concept of adopting a blood grouping system to estimate the susceptibility of the host to infectious diseases is not a recent approach and has been formerly recommended by Cooling. There are few research studies published regarding blood group vulnerability associated with COVID-19 disease severity [14].

The striking data of COVID-19 patients across the countries such as Italy, the United States of America, Brazil, and Spain showed <40% of O blood group individuals which coincided with our present study depicting the magnitude of blood group O person to non-O blood group person [15,16].

CONCLUSION

To conclude our study, we report an association between COVID-19 susceptibility and the ABO blood group system. Categorically, non-O blood groups (A, B, and AB) systems have a greater risk compared to O blood group systems. Among non-O blood group systems in our study, A blood group has a higher risk and also more ICU admissions due to COVID-19-related complications. O blood group had lesser ICU admissions compared to other ABO blood group systems with fewer and minor symptoms.

This research can have probable clinical ramifications on the COVID-19 crisis, non-O blood group people might require stiffened personal safety to decrease the likelihood of COVID-19 infection and cautious surveillance and invasive treatment regimen.

It might be advantageous to recommend ABO blood grouping in COVID-19 patients as a routine investigation and management of SARS-CoV-2 infections which helps to delineate treatment protocols and to determine the vulnerability of the people.

This study is gathered from a defined number of patients admitted to our tertiary center; furthermore, chronic preceding medical illnesses and asymptomatic patients are not addressed in our research due to inadequate data limiting the implication of the survey.

Accordingly, it would be untimely adoption of this study to model the scientific practice at this point. Nonetheless, these research findings are far-reaching and challenging which facilitates further studies to justify.

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AUTHORS' CONTRIBUTIONS

All authors reviewed and accepted the manuscript.

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CONFLICTS OF INTEREST

No conflicts of interest.

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