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Original Research

Study to estimate the role of blood groups in the development of cardiovascular complications among SARS Cov 2 patients – A cross-sectional study

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Abstract

Background: SARS Cov 2 virus infection has led to the development of morbidities and mortalities throughout the world in the form of a pandemic. **Aim:** To find out the role of blood group antigens in the development of cardiovascular complications among those infected with SARS Cov 2 infection. **Materials and methods**: Details of 134 patients were collected who were infected with SARS Cov 2 and admitted to Chettinad Hospital and Research Institute. **Results:** There was no significant role of blood groups in the severity of Covid infection or in the development of cardiovascular risks among Covid patients.

Keywords: Blood groups, SARS Cov 2,cardiovascular complications.

Introduction

SARS Cov2 has led to the development of a pandemic throughout the world. This disease has proven to show varying effects on the world population, especially having a serious effect on older patients and those having comorbidities like cardiovascular diseases, diabetes and, pulmonary diseases. Taking into account the morbidity and mortality of this disease lot of effort has been put by the scientific committee throughout the world into finding out the special characteristics and risk factors associated with the severity of SARS Cov 2 cases.

There have been studies at the molecular level showing the role of ACE (Acetylcholine esterase) receptors as entry points for SARS Cov 2 viruses.

Previously studies have shown the role of ABO blood group antigens in the development of cardiovascular diseases, cancer, and various infectious diseases. A study done among the Chinese population has shown a relationship between ACE activity and ABO blood group antigens. They have shown that O blood group type patients will have low ACE activity [1].

Another study has shown that O blood group patients will have higher interleukin-6 levels in the blood [2].

Previous studies have shown that 'A' antigens will prevent the cleavage of P selectin and intercellular cell adhesion molecule 1 (ICAM-1)

and so will prolong the binding of leukocytes to the vascular endothelium, thereby promoting inflammation and predisposing to atherosclerosis and development of cardiovascular diseases [3].

A study done by Zhao et al. showed that persons with blood group O have lower susceptibility to getting infected with SARS Cov 2 and those with blood group A have higher susceptibility to incurring the disease [4]. Another study done by Zeitz and Tatonetti has shown that people with blood group A have higher odds of contracting the disease [5].

Aim

To find out the role of ABO blood group antigens in the response to SARS Cov 2 infection.

Objectives

1. To find out the association between ABO blood group antigens with the severity of SARS CoV 2.
2. To estimate the role of ABO blood group antigens in the development of cardiovascular risk among SARS Cov 2 patients.

Materials and methods

Study design: Retrospective cross-sectional study.

Study duration: 5 months.

Sample size

The sample size is calculated using the formula Z^2PQ/d^2 with a confidence interval of 95%, prevalence rate of 15% with limit accuracy of 0.05%.

Where Z=Confidence interval of 95%,
P=Prevalence of the disease, (Q=1-P)
D=Precision=5%
=195

One hundred and ninety-five patients between the age group of 20–70 years of both sex who attended Chettinad Hospital and Research Institute from July 2020 to November 2020 diagnosed with SARS Cov 2, will be included in the study. The clinical criteria for the diagnosis will be as per the ICMR guidelines. All patients who were diagnosed with SARS Cov 2 after examination of SARS-CoV RNA by reverse transcriptase polymerase chain reaction by analyzing the E gene and the S gene, in the Microbiology Department of Chettinad Hospital and Research Institute, Kelambakkam. The patients will be divided into two groups depending on whether they had cardiovascular complications or not.

Exclusion criteria: Patients admitted to our hospital due to diseases other than SARS Cov 2.

SARS Cov 2 patients with HIV infection, pregnant women with Covid infection, patients less than 18 years of age, patients with cancer.

Methods

Institute Ethical Committee approval will be obtained before commencement of the study.

Data collection

The medical records of 134 patients were collected and examined. We retrieved the details of biochemical investigations, clinical, drug history, and demographic details of the patients.

Laboratory examination

Details regarding patients' age, height, weight, BMI, blood pressure, previous comorbidities, previous drug history, and present clinical profile will be collected. Data regarding biochemical investigations like troponin I, CK-MB, BNP, Ferritin, LDH, and albumin levels were retrieved from the patients' case sheets. Any value above the reference interval of our laboratory was considered abnormal. Details regarding the blood group and Rh factor of the patient were retrieved from the blood bank with permission.

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Statistical analysis

SPSS version 20 was used for the analysis of the data. We collected the data of 134 patients affected with SARS COV 2. The details regarding the blood group of the patient, ferritin levels, LDH levels, and albumin levels along with the details of the cardiac profile (Troponin I, BNP, and CK-MB) were collected from the patients' case sheets. A cumulative frequency test was done to find out the number of patients falling into the different blood groups [Table 1]. Among the 134 patients, 123 were Rh +ve and 11 were Rh –ve [Table 2]. Among males O+ve group was more prevalent and among females, B +ve group was found to be more common [Table 3]. A Chi-square test was done to find out whether there are any significant differences in the levels of the various inflammatory parameters and cardiac markers among the different blood groups (p-value<0.05 was considered significant).

Ethical issues involved and steps taken to prevent such issues

Full information will be given to the participant about the purpose of the study, who will have access to the results, the risks involved in the study and about the costs and charges to the patients. The cost of the tests will be borne by the investigator. Consent forms will be accompanied by patients information sheets for participants setting out information about the proposed study along with details of the investigators and how they can be contacted. Confidentiality of the results of the respective participants will be maintained.

Discussion

The prevalence of SARS Cov 2 is continuing throughout the world in the form of different mutations in the genome of the virus. A lot of studies have been published on the risk factors

Results

Table 1: The frequency of the types of blood groups in the study sample.

Types of blood group	Frequency	Percent	Valid percent	Cumulative percent
O Rh+	41	30.6	30.6	30.6
O Rh–	7	5.2	5.2	35.8
B Rh+	42	31.3	31.3	67.2
B Rh–	3	2.2	2.2	69.4
A Rh+	30	22.4	22.4	91.8
A Rh–	1	.7	.7	92.5
AB Rh+	10	7.5	7.5	100.0
Total	134	100.0	100.0	

Rh – Rhesus factor.

Table 2: The frequency of Rh positivity and negativity among the subjects.

		Frequency	Percent	Valid percent	Cumulative percent
Valid	Rh+	123	91.8	91.8	91.8
	Rh–	11	8.2	8.2	100.0
	Total	134	100.0	100.0	

Rh – Rhesus factor.

Table 3: The frequency of distribution of the various blood groups among males and females.

Sex			Frequency	Percent	Valid percent	Cumulative percent
Male	Valid	O Rh+	32	33.3	33.3	33.3
		O Rh–	7	7.3	7.3	40.6
		B Rh+	29	30.2	30.2	70.8
		B Rh–	3	3.1	3.1	74.0
		A Rh+	20	20.8	20.8	94.8
		A Rh–	1	1.0	1.0	95.8
		AB Rh+	4	4.2	4.2	100.0
		Total	96	100.0	100.0	
Female	Valid	O Rh+	9	23.7	23.7	23.7
		B Rh+	13	34.2	34.2	57.9
		A Rh+	10	26.3	26.3	84.2
		AB Rh+	6	15.8	15.8	100.0
		Total	38	100.0	100.0	

Rh – Rhesus factor.

Table 4: The Chi-square analysis of the parameters among the various blood groups.

	Blood groups	
Variables	Pearson's chi square value	Significant value
Troponin I	8.565	0.073
BNP	5.203	0.158
CK-MB	4.365	0.225
Ferritin	2.145	0.543
LDH		
Albumin	8.565	0.036

BNP – Brain natriuretic peptide; CK-MB – Creatine kinase-MB; LDH – Lactate dehydrogenase.

for the development of the SARS Cov 2 virus. Acetylcholine esterase enzyme 2 receptors have been found to have a role in the entry of the SARS Cov 2 virus into the human body. There is a relationship between the levels of ACE 2 receptors and the type of blood group.

Patients having the O blood group have lower levels of ACE receptors when compared to other non-O blood groups [6]. GWAS (Genome wide Association Study) has shown that subjects having O blood groups express more inflammatory markers like Interleukins in their blood than other blood group subjects. So the subjects in this blood group have higher protection from infections.

Hypertension is the main cause of the development of cardiovascular risks worldwide. Hypertensive patients have higher levels of ACE enzyme levels in their blood. These enzymes are associated with the RAAS axis (Renin Angiotensin Aldosterone Axis) which is responsible for the regulation of blood pressure. ACE 2 has many beneficial effects like it reduces the inflammatory pathways and injury by free radicals [7].

'A' blood group has been shown to protect the P selectin and ICAM 1 from enzymatic cleavage, thereby increasing the attachment of more adhesion molecules in the endothelial lining of the blood vessels leading to the narrowing of the blood vessels and reducing the coronary blood circulation. These in turn increase the chances for patients in the 'A' blood group to develop more cardiovascular risks than other blood group subjects [8].

In this study, there were 48 patients with O blood group, 45 patients with B blood group 31 patients with 'A' blood group and 10 patients with AB blood group. Among these patients, those patients having Rh+ blood groups were

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123 and only 11 affected patients had Rh– blood groups.

Chi-square analysis showed no significant difference in the levels of ferritin, LDH, Troponin I, BNP, and CK-MB levels among the patients with different blood groups [Table 4]. Albumin levels showed a significant difference between the various blood groups. According to this study, blood groups don't play a major role in the development of cardiac complications among SARS Cov 2 patients.

Zhao et al. showed that the patients in the 'A' blood group had more susceptibility to develop SARS Cov 2 than O blood group patients [9].

Some studies have shown a negative relation between the blood groups and the severity of SARS Cov 2. A study done by Latz et al. [10] has shown no relationship between the ABO blood groups and susceptibility to SARS Cov 2 infections.

Conclusion

According to this study, we have found out that the blood group does not play an important role in the development of cardiac complications among SARS Cov 2 patients.

Drawbacks

Small sample size of the study.

Conflict of Interest

The authors declare no conflict of interest.

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