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ABO blood group as predictor of severity and susceptibility of COVID-19 in pregnancy: A retrospective study

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Abstract
Background: Pregnant women are evaluated as a high risk category to get COVID-19 infection due to immunocompromised status and hypercoagulable state which was evident in the second wave of COVID-19 in India reporting a high mortality in pregnant patients. Various factors like Diabetes, Hypertension, etc have been correlated with severity of disease. The union of the type of ABO blood group along with severity is still lacking. This current study was done to examine the alliance of the severity of COVID-19 with blood group type in pregnant females.
Materials and Method: The pregnant women's age, gestation, and parity was recorded. RT- PCR was done for the confirmation of the SARS-CoV-2 status. Rh and ABO blood types were inferred at the time of admission. The chi-square tests and unpaired t-test were employed for the comparison of data.
Results: The mean age of the study population was 26.54±4.57 (18-43 years). There were 35.9% B-blood group, 27.8% A-blood group, 11.4% AB blood group and 24.9% O blood group mothers. Severe Symptomatic COVID-19 was significantly more among AB –ve (40.0%), A –ve (14.8%) and A +ve (14.1%) blood groups.
Conclusion: Blood type O, had less severe progression of the disease.

Keywords: Blood group, COVID-19, pregnant women

Introduction
Novel coronavirus arose from Wuhan city in China in the year 2019, and was named as COVID-19 by WHO [1]. Because of its rapid spread from one to another led to a public health crisis and was declared as a global pandemic and as a matter of international concern.
COVID-19 pneumonia mainly induces common inflammation in the cells of endothelial that might affect multiple organ structures leading ultimately to vascular thrombosis [2]. Furthermore Pregnancy heightens the threats of COVID-19 drawbacks, primarily the thrombotic complications [3, 4]. Pregnancy itself being a hypercoagulable state, leads to further more complications.
Some of the risk factors related to COVID-19 are recognized, such as age, sex, smoking, and associated co morbid states such as diabetes, high blood pressure, and obesity-related features and cardiovascular diseases. Genetic factors may also be linked to the host responses. Blood type as a genetic marker can be related to COVID-19. The difference in antigens of blood types can increase or decrease the sensitivity of the host to many infections [5-8].
The blood type ABO is encoded by the gene of ABO which is existing at chromosome 9. Various National and International researches have laid the hypothesis that indicated that this gene directly or indirectly moderates an individual's COVID-19 susceptibility. SARS- CoV-2 has the power of replicating the epithelial cells which expresses the antigens of A and B present in the lungs [9]. Those individuals having O blood type present with both the antibodies of anti A and anti B that is responsible for targeting the epithelial cells of SARS-CoV-2 infected lungs, which in turn offers protection. The people having O blood type are also possessed with a low amount of biological activity which surrounds the circulating concentrations of the von Willebrand factor or vWF, which is another carrier protein to carry the coagulation factor VIII that is critical regarding blood coagulation and might also promote lower risks related to thromboembolic diseases [10].
There is paucity of the studies on the establishment of the link between COVID-19 and type of blood group.

The present study is the first and foremost study done in Northern India to assess the association of the stringency of COVID-19 with the type of blood group in pregnant females.

Materials and method

Study population

The study was retrospective and included COVID-19 positive pregnant women whose blood analysis was performed. A total of 281 patients were included. The study excluded non-pregnant women.

Study procedure

The pregnant women's age, gestation, and parity was recorded. RT-PCR was done for the confirmation of the SARS-CoV-2 status. ABO and Rh blood types were inferred at the time of admission.

Ethical clearance

Penned notified consent was collected from every patient. The approval of the research ethics committee was obtained for this study.

Statistical analysis

With the 25.0 software of SPSS version (PASW Statistics for Windows, related to the SPSS Inc.: Chicago, IL, USA), the Statistical estimation was conducted. For illustrative estimates, we evaluated the mean, median, standard deviation, minimum and maximum limits. The unpaired t-test and chi-square test were used for the comparison of data. To identify the hypothesis conclusions, the standard cut-off implication of p-value of 0.05 was used.

Results

The mean age of the study population was 26.54±4.57 (18-43 years). Maximum subjects belonged to 18-25 years (53.0%) followed by 26-35 years (42.7%) and > 35 years (4.3%). (Table 1)

In our study, there were 35.9% B-blood group, 27.8% A-blood group, 11.4% AB blood group and 24.9% O blood group mothers. (Table 3)

Severe Symptomatic COVID-19 was significantly more among AB –ve (40.0%) AB+ve (14.8%) and A +ve (14.1%) blood groups. (Table 4)

Tables

Table 1: Age wise distribution of study population

Age groups	Frequency	Percent
18-25 years	149	53.0%
26-35 years	120	42.7%
> 35 years	12	4.3%
Mean±SD	26.54±4.57 (18-43 years)	

Table 2: Distribution of parity among study population

Paritry	Frequency	Percentage
Primigravida	79	28.11%
G2	96	34.16%
G3	64	22.77%
G4	28	9.96%
G5	10	3.55%
G6	4	1.42%

Table 3: Blood group distribution of study population

Blood group	Frequency	Percent
A -ve	7	2.5%
A +ve	71	25.3%
B -ve	8	2.8%
B +ve	93	33.1%
AB -ve	5	1.8%
AB +ve	27	9.6%
O -ve	5	1.8%
O +ve	65	23.1%

Table 4: Association of Blood group with severity of COVID-19

Blood Group	Asymptomatic	Mild Symptomatic	Moderate Symptomatic	Severe Symptomatic
A +ve	53	8	0	10
	74.6%	11.3%	0.0%	14.1%
A -ve	7	0	0	0
	100.0%	0.0%	0.0%	0.0%
AB +ve	16	5	2	4
	59.3%	18.5%	7.4%	14.8%
AB -ve	1	2	0	2
	20.0%	40.0%	0.0%	40.0%
B +ve	74	13	4	2
	79.6%	14.0%	4.3%	2.2%
B -ve	8	0	0	0
	100.0%	0.0%	0.0%	0.0%
O +ve	56	5	1	3
	86.2%	7.7%	1.5%	4.6%
O -ve	4	1	0	0
	80.0%	20.0%	0.0%	0.0%

Table 5: Association of blood type with mortality

Blood Type	Mortality
A +ve	4
A-ve	0
B+ve	3
B-ve	0
AB+ve	0
AB-ve	1
O+ve	1
O-ve	0
Total	9

Table 6: Association of Rh Blood type with severity of COVID-19

Rh blood type	Asymptomatic	Mild Symptomatic	Moderate Symptomatic	Severe Symptomatic	Total
Rh Positive	199	31	7	2	256
Rh Negative	20 (80%)	3 (12%)	0	2 (8%)	25

Discussion

Pregnant women are supposed as a high risk community for COVID-19 infection due to immunocompromised status and hypercoagulable state which was evident in the second wave of COVID-19 in India reporting a high mortality in pregnant patients. Various factors like diabetes, hypertension, etc have been correlated with severity of disease. The coalition of types of blood group like ABO along with the severity is still required. In our study, there were 35.9% B-blood group, 27.8% A-blood group, 11.4% AB blood group, and 24.9% O blood group mothers. This is compatible with the findings reported by Boston's *Latz et al.* [11] and from New York's *Zietz et al.* [12]. *Rahim et al.* [13] found a considerably elevated percentage of blood group-B in COVID-19 patients group, 35.9% with higher

odds (1.19) of testing positive. *Mirzae et al*. [8] reported 28.6% patients had blood types of A+ and O+, 23.2% patients had B+, 12.5% patients had AB+, 5.4% patients had O-, 1.8% patients had A- blood type. This was found to be non-consistent with the results of our study. Dissimilar findings were reported by *Covali et al*., [14] where a slightly increased rate of pregnant patients posing the blood group A at term got compared with those patients from different blood groups. *Bhandari et al.* 15 identified that the patients from blood group A were slightly more in number than any other blood type in that infected group. Additionally some other factors which were even involved resulted that there was no such important differentiation noticed statistically between the distributions of ABO blood group amidst the patients who are infected from SARS- COV 2.

Wu et al.5 reported that the risk of COVID19 infection in patients with the blood type of A is higher than all, and patients with the blood type of O have a lower risk of infection with COVID-19 which is co relating with our present study, where blood type O was a protective factor for severity of disease. The frequency of ABO distribution that has been carried out in the research work by *Ahmed et al*. [3] was based on the patients who were seriously infected with SARS-CoV2. The results show that the patients belong from blood group A dominated by 35%, Leicester, that was similar with the frequency level of 40% of the patients having blood group A and it was 24% of patients for blood group O

Rahim et al. [16] reported that an amount of susceptibility was noticed amidst the person who belongs from the blood groups of AB and B group. In Pakistan the individuals having the blood group B dominate for 38% over the blood groups. In Iran, *Abdollahi* [17] noticed that in the patients having the blood group AB an increased rate of infection is noticed rather than the patients belonging from the blood group O and the incidence of infection was also lower in them. In Canada, *Ray et al*. [18] estimated that the blood group O had much lower risks of posing any serious illness like COVID-19 even the morbidity level from COVID-19 was lower in them than any other blood groups.

There were 9 mortalities among 281 patients with 4 in A+ve blood group and 3 in B+ve blood group. Although AB -ve patients were 5 in number but mortality was seen in 1 patient.

In the current study, no strong relation was found between Rh positive and Rh Negative pregnancy in progression of disease with 80% among Rh negative patients as asymptomatic similar to Rh positive patients with 77.7% being asymptomatic.

The current study included a population of 281 COVID-19 positive pregnant females, which is a large pool and can be considered for pregnant females although it did not include non-pregnant females, the general population and thus, the results cannot be generalised.

Conclusion

The current study establishes that pregnant females with O blood group had less progression of COVID-19 infection although further studies are required to generalise it for the general population.

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