ORIGINAL ARTICLE

Host Factors and Blood Group Related to RT-PCR Positive COVID-19 Patients in a Tertiary Care Hospital

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Abstract

Introduction: The rapid emergence of Novel coronavirus (COVID-19) is a global pandemic, currently spreading across the world. Susceptibility to contracting COVID-19 and severity of the disease while it runs its course seems to be related to a number of host factors and as well as blood group related factors.

Methods: A cross sectional type of descriptive study conducted in PCR & Molecular Laboratory of Green Life Hospital Ltd. aims to find out the relationship of ABO blood type with RT-PCR positive COVID patients. Data were collected by data collection sheet and inputted into data spread sheet through online link to Google form.

Results: Among 1923 positive cases median (IQR) of age was 44.0 (31.0 – 59.0) years and highest number (21.4%) of people were in 31- 40 years of age group. In this study median (IQR) age of female and male was almost same. But male were more vulnerable than female in age group of 31 to 40 and also 61 to 70. This study revealed that people of positive cases having O positive and B Positive blood group were highest in percentage (25.8% and 25.6% respectively) followed by A positive (21.9%) and AB positive (8.5%). In this study O positive and A Negative blood group had statistically significant relationship with COVID positive test result (X2 = 9.291, p = 0.002 and X2 = 5.460, p = 0.019 respectively). Odds with 95% CI of O positive blood group indicate that it has more chance to be COVID positive (Odds ratio = 1.199, CI = 1.067 – 1.348) and A negative act as a protective factor (Odds = 0.798, CI = 0.661- 0.965).

Conclusion: ABO blood typing could be helpful marker to guide physicians with the early diagnosis and follow-up of COVID-19. More comprehensive studies are needed to evaluate the independent effect of blood groups on COVID 19 infection. Individuals with blood group O positive must diligently uphold personal health hygiene measures and undergo screening test to protect themselves against COVID-19.

Key wards: RT-PCR, COVID-19, Blood group

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Introduction:

Novel coronavirus (COVID-19) is a global pandemic currently spreading rapidly across the world. Susceptibility to contracting COVID-19 and severity of the disease while it runs its course seems to be related to a number of host factors and as well as blood group related factors.

COVID-19, caused by the SARS-CoV-2 virus and has caused over 21.1 million confirmed infections and over 761,000 deaths worldwide as of August 17, 2020.[1] SARS-CoV-2 is spread by respiratory droplets and diagnosed by detection of viral genome by real-time reverse transcription-polymerase chain reaction (RT-PCR) testing of a nasopharyngeal swab or other specimen.[2]

Some factors for like age, sex, smoking and chronic co-morbidities are responsible for COVID-19 morbidity and

mortality.[3,4] The observed variability in susceptibility to SARS-CoV-2 and severity of COVID-19 have raised intense interest in their environmental and genetic risk factors. The ABO blood type has formerly been associated with the status of COVID – 19 infection.[5]

Several works have been published to understand the great heterogeneity in the infection and the clinical manifestations of SARS-CoV-2 in different patients. Several biomarkers have been proposed as risk or protective factors. In this aspect, a recent scientific paper, presents the results of a Genome-wide analysis focused on COVID19 patients.[6] One of the associated loci in chromosome 9 which point to an association between ABO blood group and risk of infection by SARS-CoV-2. This association with the ABO blood group has been previously reported in other series showing that Group A is a risk factor while Group O seems to be a protective factor against SARS-CoV-2 infection. These reports motivated widespread interest in evaluating ABO blood groups as potential COVID-19 risk factors. [7]

It has been revealed that the blood group antigens found in erythrocytes and other tissues interact with microorganisms such as bacteria, viruses, parasites and fungi. Differences in blood group antigen expression can increase or decrease host susceptibility to many infections. This can play a direct role in infection by acting as a receptor or coreceptor for blood group antigens, microorganisms, parasites and viruses.[8,9] ABO antibodies can also be considered as part of the innate immune system against some bacterial pathogens and enveloped viruses carrying ABO-active antigens.[10] Helicobacter pylori,[11] Vibrio cholera[12,13], hepatitis C virus,[14] human immunodeficiency virus[15] and SARS[16] are some of the infectious agents that have been shown to be associated with human blood groups.

Although previous studies have revealed several risk factors for Corona virus disease, the relationship between SARS-COV-2 with the ABO blood group is yet to be established. Moreover, very few studies were conducted in Bangladesh to find the link between the two. This study aimed to find out the relationship between the ABO blood type and RTPCR positive COVID-19 patients.

ABO blood typing could be helpful marker to guide physicians with the early diagnosis and follow-up of COVID-19 and help to bring confidence to identifying those patients warrant closest surveillance.

Methods:

This was a descriptive type of cross sectional study conducted from 20th March to 19 July, 2021. It was carried out in PCR & Molecular Laboratory of Green Life Hospital Ltd. to evaluate the relation of ABO blood group and RT-PCR positive COVID-19 Patients. Eight thousand seven hundred and twenty six cases were selected from all persons those who gave sample for COVID-19 RT- PCR test within that period of time. Data were collected by data collection sheet and inputted into data spread sheet through online link to Google form (URL link: https://forms.gle/SRDsTFikQuzWmJHk8). After completion of data collection and entry, those was checked, verified, edited for consistency and rechecked. Data analysis was done by using 26 version of SPSS software. Then various tables were made and analyzed according to the objectives. Frequency and descriptive analysis were done initially followed by bi-variate analysis. Chi-square test was done for categorical variables.

Results:

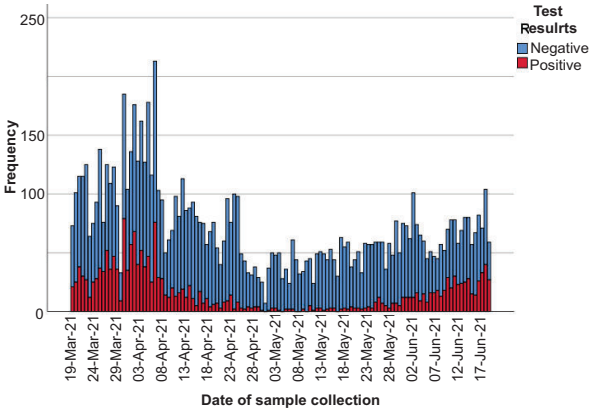

Figure-1: *Distribution of number of sample collection layered with test result according to date.*

The graph illustrates the number of cases reached its peak in between the first and second week of April followed by a gradual decline in the next few weeks. There was a steady rise in cases again around the third week of June that significantly reached a high in the third week of July.

Table-I

Distribution of sample by Residence including areas under Dhaka District (n=6002)

Residence	f	%
Dhanmondi	2004	33.3
Mirpur	1223	20.3
Khilgaon	640	10.6
Tejgaon	527	8.7
Old Dhaka	395	6.5
Mohammadpur	389	6.4
Gulshan	262	4.3
Jatrabari	211	3.5
Baridhara	207	3.4
Keraniganj	144	2.3
Total	6002	100

Two third of the people (77.3%) were from Dhaka followed by Chittagong (13.4%) and other divisions. From Dhaka division, maximum samples were from Capital City Dhaka and second highest from Narayanganj area. One third of the samples were from Dhanmondi area that is 33.3% followed by Mirpur (20.3%).

Table-1I

Specimen collection site

Specimen	f	%
Nasal Swab	8638	99.0
Throat Swab	88	1.0
Total	8726	100.0

Ninety nine percent specimen was collected from nasal swab and only 1% specimen from throat swab.

Table-III

COVID test Results

Test	f	%
Negative	6803	78.0
Positive	1923	22.0
Total	8726	100.0

Among 8726 people, maximum (78 %) tested negative whereas only 22% were positive.

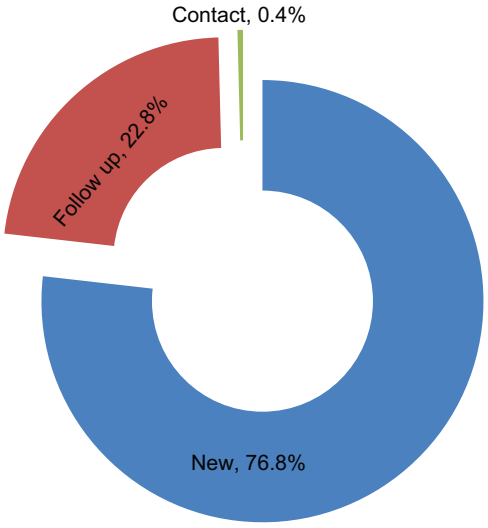

Figure-2: *COVID-19 positive cases with case types (n = 1923)*

Among the COVID-19 positive persons 76.8% were new cases. It was found that 22.8% follow-up cases but only 0.4% was contact case.

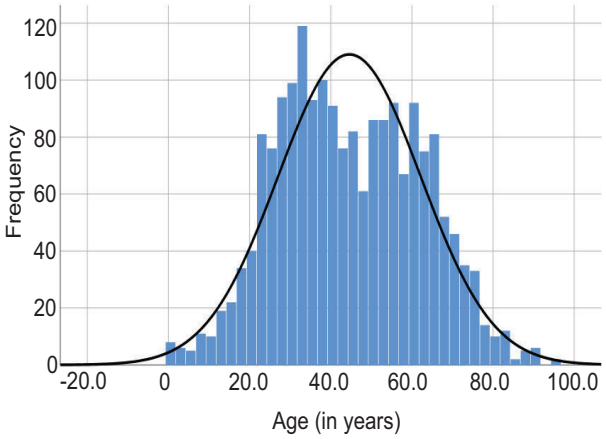

Figure-3: *Age distribution of positive cases (n=1923)*

Among all COVID positive cases, highest number of (21.4%) of people were in 31- 40 years of age-group and almost same (17%) were in 21-30 and 51-60 age-groups but only 1.1% were in 81-90 years of age group. Only 0.3% was in above 90 years. Median (IQR) age of COVID-19 positive patients was 44.0 (31.0 – 59.0) years.

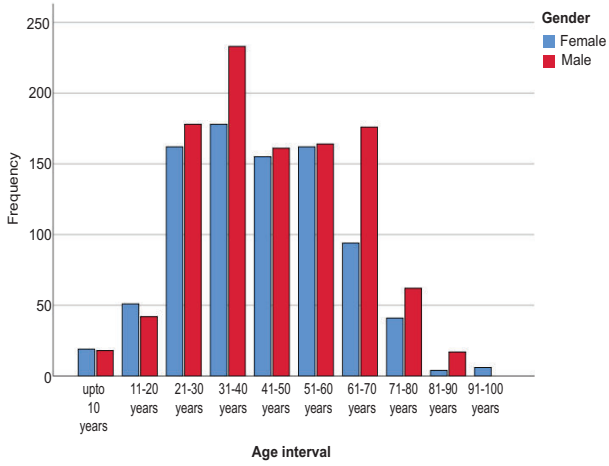

Figure-4: *Gender distribution according to age group of COVID positive cases (n=1923)*

Among positive cases median (IQR) age of female and male were almost same that is 43.0 years (30.0 – 56.0) and 44.0 years (32.0 – 60.0) respectively. But no of test positive male were more than female in age-groups of 31 to 40 and 61 to 70 years. The ratio of male and female were almost same in other age groups. It was surprising that only female were affected after 90 years.

Table-IV

Symptoms of positive cases (n=1923)

Symptoms	Frequency	Percentage (%)
Asymptomatic	154	8.0
Symptomatic [a]	1769	92.0
Fever	946	49.2
Cough	1357	70.6
Shortness of Breath	1041	54.1
Sore Throat	645	33.5

[a] = Multiple answers were accepted.

Among all test positive sample very few (8%) were asymptomatic. Most of them (92%) came with symptom like cough (70.6%), shortness of breath followed by fever and sore throat.

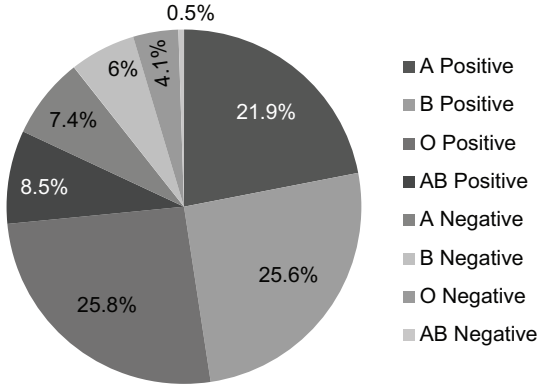

Figure-5: *Distribution of Blood group among test positive cases (n=1923)*

People having O positive and B Positive blood group were highest in percentage (25.8% and 25.6% respectively) followed by A positive (21.9%) and AB positive (8.5%). Rh negative blood groups were very few in percentage.

Table-V

Association between COVID positive test results with blood group (n=1923)

Variable	Odds Ratio	95% Confidence Interval	P value
A Positive	1.050	0.929 – 1.187	0.437
B Positive	0.992	0.884 – 1.114	0.897
O Positive	1.199	1.067 – 1.348	0.002 (<0.005)
AB Positive	0.893	0.746 – 1.069	0.217
A Negative	0.798	0.661 - 0.965	0.019 (<0.05)
B Negative	0.836	0.678 – 1.031	0.093
O Negative	0.981	0.760 – 1.268	0.885
AB Negative	0.721	0.364 – 1.425	0.344

O positive and A Negative blood group had statistically significant relationship with COVID positive test result (X2 = 9.291, p = 0.002 and X2 = 5.460, p = 0.019 respectively). Odds with 95% CI of O positive blood group indicate that it has more chance to be COVID positive (Odds ratio = 1.199, CI = 1.067 – 1.348) and A negative act as a protective factor (Odds = 0.798, CI = 0.661- 0.965).

Discussion:

In this study among 1923 positive cases median (IQR) of age was 44.0 (31.0 – 59.0) years and highest number (21.4%) of people were in 31- 40 years of age group. This result coincide with another study in United State, where mean ± SD of age was 44.6 ± 16.8 among test positive people.[17] But in Turkey among 823 study population belonged age 18–97 years, mean ± SD was 58.6 ± 17.0.[18] Another study in Bangladesh among 474 positive cases mean ± SD of age was 64 ±16.[19]

In this study median (IQR) age of female and male was almost same. But male were more vulnerable than female in age group of 31 to 40 years and also 61 to 70 years. Similarly in Turkey, male cases (57.1%) were more in number than female (42.9%).[18] Opposite scenario found in United State where women were more at risk than man (73.6% vs. 26.4%)[17] and also in another study of Bangladesh.[19]

This study revealed that people of positive cases having O positive and B Positive blood group were highest in percentage (25.8% and 25.6% respectively) followed by A positive (21.9%) and AB positive (8.5%). Rh negative blood groups were very few in percentage. Similarly a study conducted in United State where the frequencies of O (48.1%) was highest followed by A, B and AB were 39.6%, 9.0%, 3.2% respectively.[17] Other studies in different places also showed different scenario where blood group A was predominant among cases.[19,20] A study conducted in Bangladesh the ABO blood group displayed a percentage distribution for A, B, AB and O were 37.35%, 17.38%, 26.46%, 18.81% respectively and clinical symptoms were significantly more common in patients with blood type A ($p < 0.05$).[19] In Lebanon also, COVID 19 patients with their blood group A+ was 39.9%, followed by O+ (35.6%), B+ and AB+ were 11.1% and 5.0% respectively. Rh negative were very few in number.[20] In Delhi, India, COVID-19-infected patient's blood group B was predominant (41.80%) followed by the frequencies of A, O, and AB were 29.93%, 21.19%, and 7.98%, respectively. But 98.07% were Rh positive.[21]

The growing interest in the relationship between ABO blood groups and COVID 19 led to several subsequent studies which reported controversial results. In this study

O positive and A Negative blood group had statistically significant relationship with COVID positive test result (X2 = 9.291, p = 0.002 and X2 = 5.460, p = 0.019 respectively). Odds with 95% CI of O positive blood group indicate that it has more chance to be COVID positive (Odds ratio = 1.199, CI = 1.067 – 1.348) and A negative act as a protective factor (Odds = 0.798, CI = 0.661- 0.965). But this findings is not coincide with the study conducted in Delhi, India, where blood group A (odds ratio, 1.53; CI, 1.40–1.66; p < 0.001) and B (odds ratio, 1.15; CI, 1.06–1.24; p < 0.001) is observed to be significantly associated with COVID-19 susceptibility whereas blood group O (odds ratio, 0.65; CI, 0.59–0.71; p < 0.001) and AB (odds ratio, 0.66; CI, 0.59–0.71; p < 0.001) have low risk of COVID-19 infection. Rh+ are found to be more risk than Rh" blood group.[21] Similarly in Turkey, the prevalence of COVID-19 was higher in blood groups A, B, and AB but lower in blood group O. [18]An early report from China suggested that blood group A was associated with increased susceptibility and blood group O was associated with reduced susceptibility to SARS-CoV-2 infection.[22] Another study in Bangladesh clinical symptoms were significantly more common in patients with blood type A ($p < 0.05$) and they were more likely to die in comparison to the patients with other blood types ($p < 0.05$).[19] Subsequent studies from Italy and Spain reported that blood group A was associated with an increased risk of severe COVID-19 and blood group O was associated with a reduced risk. [23] In Lebanon COVID 19 positive groups with A Rh+ increases susceptibility to COVID 19. There was no significant relationship between COVID19 and other blood groups.[20]

In contrast a study in New York, it was estimated that Rh-negative blood type to have a protective effect for increase infection which is coincides with our study but they suggesting that increased infection prevalence among non-O types.[24] However no other study results coincide with this study as because we have highest number of cases with O positive which is identified as second common blood group among the population of Dhaka city.[24] More studies will be useful for comparing results and to understanding whether findings differ in different populations because the frequency of blood groups is variable between populations.

Individuals with blood group O positive must diligently uphold personal health hygiene measures and undergo screening test to protect themselves against COVID-19.

There are many factors, other than blood groups such as genetics, geography and viral strain that determine the contagiousness and severity of COVID 19 infection. Many of these are still unexplained. Furthermore, this study does not consider the effect of other risk factors such as comorbidity. Comorbid conditions are not evenly distributed among cases of different blood groups which may act as confounders and has chance of bias. Bigger sample size, multicenter and comprehensive prospective studies with more careful designs are needed to conduct for control confounding effect and to evaluate the independent effect of blood groups on COVID 19 infection.

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