ORIGINAL ARTICLE

# THE POTENTIAL USE OF ABO BLOOD GROUP SYSTEM IN RISK STRATIFICATION OF COVID-19 INFECTION

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## ABSTRACT

**Background:** The objective behind this study was to determine the potential use of ABO blood group system in risk stratification of COVID-19 infection.

**Material and Methods:** This cross-sectional observational study was conducted at the Department of Pathology, Combined Military Hospital (CMH), Quetta from March 2020 to February 2021. All adult patients with polymerase chain reaction (PCR) positive for Severe Acute Respiratory Syndrome Corona Virus 2 (Sars-CoV2) were evaluated for their ABO blood grouping. A comparison was made between age, severity of symptoms, place of isolation, and treatment taken with ABO blood groups by using fisher's exact and chi-square test, a p value <0.05 was considered statistically significant.

**Results:** A total of 218 patients who were Sars-CoV-2 PCR positive were included for final analysis. Overall mean age was 27.98±4.55 years. The most common blood group was O (n = 75, 34.4%) and least common was AB (n = 26, 11.9%). Male patients with blood group AB and O were more prevalent than other blood types, but it has insignificant association, 96.1% and 92%, respectively, p value >0.05. While, patients with blood group O were asymptomatic (60%) and patients who had blood group AB (53.8%) experienced severe symptoms, p value <0.005.

**Conclusions:** Blood group O was the most prevalent and surprisingly least one in terms of disease related severity in patients affected by the Covid-19 infection.

**Keywords:** COVID-19 infection, ABO blood group system, Disease susceptibility, SARS CoV-2

## BACKGROUND

The term corona virus is derived from the Latin word "corona" which means crown because of its similarity with solar corona under the electron microscope. These are RNA viruses and were first detected in humans in 1965. These viruses are responsible for causing mild respiratory symptoms in affected individuals. However, since 2002, three major corona viruses responsible for disease outbreaks are associated with higher rates of mortality and increased disease severity owing to detrimental effects on lungs.[1,2]

Severe Acute Respiratory Syndrome Coronavirus-2 (SARS CoV-2) is the causative entity behind coronavirus disease-19 (Covid-19). It is highly virulent and its mode of transmission is via droplets. World Health Organization (WHO) in March 2020 declared Covid-19 infection as pandemic after it first emerged in the Wuhan province of China in December 2019. On 26th February 2020, the first case of Covid-19 was officially declared in Pakistan. Since then, Pakistan is dealing with myriad effects of the disease. Up till now, more than 1,575,501 cases have been diagnosed in Pakistan.[3]

The research on risk factors, associated with poor survival and higher complication rates is still going on. Multiple factors are associated with higher morbidity, mortality, and Covid-19 associated complications. Among these risk factors, the ABO blood groups have also been studied. Anderson[4] found blood group O as protective against Covid-19 infection. While other studies have shown higher rates of infection, complications, and mortality in patients with blood groups A and B. [5-8] Larger scale studies are still needed to draw a final conclusion. Studies from our region are limited and our aim is to fill the scientific gap present in

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our region and will also provide useful findings for larger scale studies.

## MATERIAL AND METHODS

A cross-sectional observational study was done from March 2020 to February 2021 at Combined Military Hospital (CMH), Quetta, Pakistan. The study was approved by the hospital and was started after taking consent from the patients. Consecutive sampling was done and all the adult patients (age more than 18 years) who were diagnosed as Covid-19 were enrolled in the study. A proforma was filled which included demographic data, clinical signs & symptoms, place of isolation, and ABO blood grouping.

For the diagnosis of patients with Covid-19 infection a standardized recommended method was used in which sample of nasal/pharyngeal swab was run through real-time reverse transcriptase polymerase-chain-reaction (PCR). Severity of Covid-19 positive patients were divided into three categorize based on the symptoms as mild (fever, cough, sore throat, malaise, headache, muscle pain, nausea, vomiting, diarrhea, loss of taste and smell. They do not have shortness of breath, dyspnea on exertion, or abnormal imaging), moderate (moderate illness is defined as evidence of lower respiratory disease during clinical assessment or imaging, with $SpO_2$ ≥94% on room air at sea level), and severe (if patient have $SpO_2$ <94% on room air at sea level, $PaO_2/FiO_2$ <300 mm Hg, a respiratory rate >30 breaths/min, or lung infiltrates >50%).

Patients who received multi-vitamins, vitamin-D supplements, antibiotics, corticosteroids, or any other remedy to relief symptoms at home or at hospital were grouped under category of "medical treatment receiver". All the PCR positive patients were further evaluated for their ABO blood grouping. A simple blood test was used to determine the ABO typing through a standardized procedure also mentioned by Mujahid A. and colleagues.[9] Patients were then evaluated based on their baseline and clinical parameters for possible association between ABO blood grouping and Covid-19 infection.

Independent t-test was used for means comparison. To determine the association of blood grouping with baseline and clinical variables we used chi-square test and a *p* value of <0.05 was considered statistically significant.

## RESULTS

A total of 218 patients who were diagnosed as Covid-19 were included for final analysis. Overall mean age was 27.98±4.55 years. The age ranged between 21 years to 38 years and majority were males (n = 196, 89.9%). Among all patients, the most common blood group was O (n = 75, 34.4%) (Figure-1). Majority of the patients had no underlying comorbid conditions and most common comorbid condition was hypertension (5.0%, n = 11) (Figure-2).

Most of our study participants were quarantined at home (n = 176, 80.7%) (Figure-3). Symptoms were categorized based on their severity. Most of our study participants did not have any symptoms (n = 100, 45.9%) (Figure-4).

Most of the patients i.e. 66% (n = 144) took medical treatment, either at home or during their hospitalization period. Only 33.9% (n = 74) of patient recovered without taking any treatment. All of our study participants recovered fully without any complications and mortality.

Table-1 shows association of blood groups with different baseline and clinical parameters. Male patients with blood group AB and O were more prevalent, however there were no significant association between gender and blood groups who develop Covid-19 infection. Most of the patients with blood group O were asymptomatic (60%), while patients who had blood group AB (53.8%) experienced severe symptoms, p value <0.01. All of the B and AB patients have taken treatment including corticosteroids as compared to rest of the patients with other blood groups, p<0.01.

**Table-1: Association between blood groups with different parameters of COVID-19 patients (n = 218).**

| Baseline and Clinical Characteristics | BLOOD GROUPS O+ (n = 75) | A+ (n = 63) | B+ (n = 54) | AB+ (n = 26) | p value |
|---|---|---|---|---|---|
| **Age - Mean±SD (year)** | 29.7±4.5 | 26.3±4.2 | 27.1±4.9 | 28.5±1.8 | 0.0001 |
| **Gender** | n, % | | | | |
| Male | 69 (92%) | 53 (84.1%) | 48 (88.8%) | 25(96.1%) | |
| Female | 6 (8%) | 10 (15.8%) | 6 (11.1%) | 1 (3.8%) | 0.3 |
| **Symptom Severity** | | | | | |
| Asymptomatic | 46 (60%) | 28 (44.4) | 25 (46.2%) | 1 (3.8) | |
| Mild | 12 (16%) | 24 (38%) | 2 (3.7%) | 11 (42.3%) | |
| Moderate | 0 (0%) | 0 (0%) | 27 (50%) | 0 (0%) | 0.0001 |
| Severe | 17 (22.6%) | 11 (17.4) | 0 (0%) | 14 (53.8%) | |
| **Isolation Place** | | | | | |
| Home | 58 (77.3%) | 52 (82.5%) | 54 (100%) | 12 (46.1%) | 0.0001 |
| Hospital | 17 (22.6%) | 11 (17.4) | 0 (0%) | 14 (53.8%) | |
| **Treatment Taken** | | | | | |
| Yes | 36 (48%) | 28 (37.3%) | 54 (100%) | 26 (100%) | 0.0001 |
| No | 39 (52%) | 35 (55.5%) | 0 (0%) | 0 (0%) | |

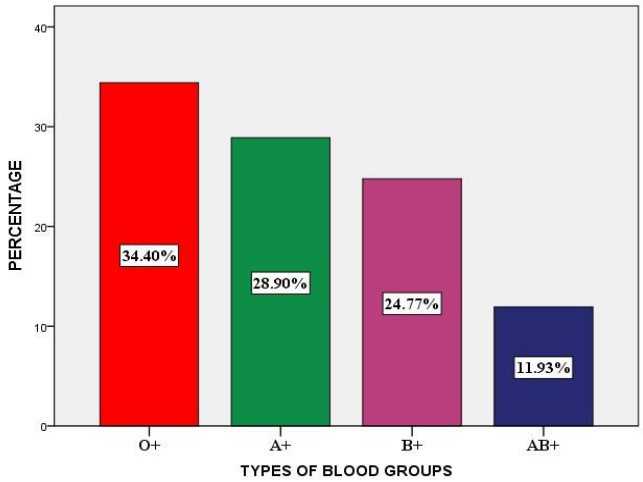


**Figure-1: Frequency distribution of blood groups (n = 218).**

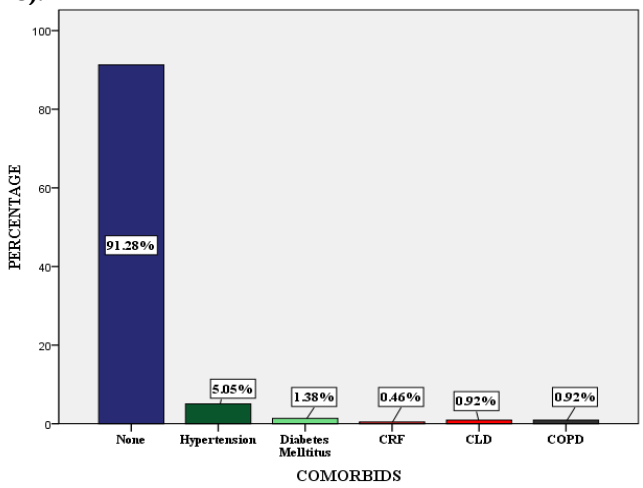


**Figure-2: Comorbid conditions in patients diagnosed as COVID-19 (n = 218).**

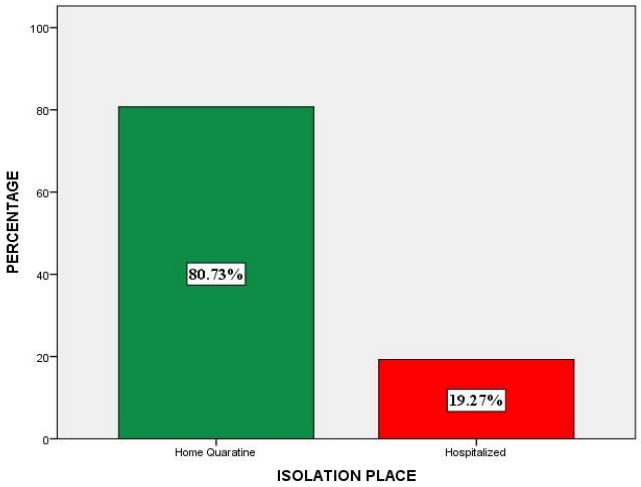


**Figure-3: Place of isolation (n = 218).**

## DISCUSSION

Since the emergence of Covid-19 infection, multiple studies have been conducted to determine the disease burden, population at risk of higher morbidity, factors involved in disease susceptibility, severity and complications. Among those risk factors, association of ABO blood grouping with Covid-19 has also been evaluated.[10,11] However, it is not clear yet that which blood group is more susceptible to Covid-19 infection. In our study we observed that patients with blood group O were more likely to get infected with Covid-19 but with mild disease. Most of the previously conducted studies are in contrast with our findings and have shown higher

rates of Covid-19 infection among patients having blood group A as compared to other blood groups[12-15] while, some studies also negate their findings and observed higher infection rates among patients with blood groups B and AB.[16-18] The difference could be because of types of blood groups distribution among different population as mentioned by the Shibeeb S and colleagues[15] in their study blood group type A was most common. While in Pakistan blood group B and O are more prevalent.[19] Another reason of less severity in our patients with blood group O could be due to genetic protection mechanism against Covid-19 infection, but the mechanism behind this is yet to be known. In a recent study Ayatollahi *et al* have shown 1.81-times lower odds of complications in patients having blood group B as compared to other types of blood groups.[20] But interestingly all these observations are statistically insignificant.

Fortunately, in our study no mortality was observed and cases of severe Covid-19 infection (based on their symptoms i.e. shortness of breath and unable to maintain oxygen saturation at room air) were observed in all blood groups. A recent study conducted by Lehrer S[21] also observed that there was no direct association between blood grouping and Covid-19 infection in terms of mortality. A systematic review conducted by Liu N *et al* and colleagues[5] had shown higher rates of deaths in Covid-19 patients with blood group A. The results till date from different populations have shown varying findings. Larger scaled studies are still needed to validate our study's findings.

## STUDY LIMITATIONS

Foremost important limitation in our study is the small sample size. The findings could be different if the study includes more data from population. Second is inclusion of other risk factors and type of treatment given to infected patients. These two limitations should be addressed in future studies.

## CONCLUSION

Blood group O was the most prevalent and surprisingly least one in terms of disease related severity in patients affected by the Covid-19 infection in our study. The results of this study are not in agreement with published data from China, United States, and Iran. Variations in ethnicity and differences in the genetic background of the study populations can be the cause behind such disparity in results. A multicentre study should be conducted on a larger sample to further elucidate the association between ABO blood groups and susceptibility to Covid-19.

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