



# Considering COVID-19 Infectiousness with Esteem to Blood Groups

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## Abstract

COVID-19 is a disease that is caused by SARS-CoV-2 and very speedily spreading all over the world. The blood group's effect on COVID-19 is not clear. The main aim of this article is to determine the relationship between sensitivity of COVID-19 and ABO blood group. For this study we have observed that the individuals with blood group A are at higher risk of getting COVID-19 because they contain the higher concentration of Angiotensin-converting enzyme-2 that provide the site to virus for entry. But in other blood groups the natural Anti A antibodies block the interaction between host receptor and virus and disturb their interaction. Certain studies show that the infectivity and mortality rate in Covid patients is not affected by AB blood group system. But according to research, increased ventilator usage, ICU stay was observed in critically ill patients with AB blood group than of other blood groups. O blood group has proved to be protective against SARS-CoV-2 due to the presence of both anti-A and anti-B antibodies as they prevent the binding of the spike protein S of the virus with the ACE2 receptors which are present on the surface of cells. Moreover, furin also plays a major role in penetration of virus in the host cells. Furin is required for the activation of the spike protein S of the virus and due to the low efficiency of furin cleavage in blood group O it is protected from SARS-CoV-2 and other chronic diseases. Mortality rate of Covid 19 depends upon the environmental factors, number of people living in the area and also some economic factors. The different strains of COVID-19 effect the different people differently and as the time passes the strain of COVID-19 has changed and thus according to this the mortality rate of different provinces and areas varies due to environmental factors. Pregnant women have no any kind of transportation of Covid to their fetuses but mostly patients of blood group A are being affected by COVID-19 and hence their fetuses are somehow effected. And those pregnant women having blood group O does not have any risk of COVID-19 of severe stages.

## Introduction

On 31<sup>st</sup> December 2019 the first positive case of severe acute respiratory syndrome was reported in Wuhan, china's Hubei province [1]. It was named from SARS-CoV-2 to Corona virus (COVID-19) in February by the World health organization WHO and was declared as a pandemic on 11 March [2] due to its spread and high mortality rate in United States and Europe [3]. The, utilization of biomarkers to foresee susceptibility to SARS-CoV-2 isn't obvious. Studies have proved that ABO blood group system also have a relation with the spread and the percentage of disease (SARS-CoV-2) [4,5]. Moreover, studies have shown the increased risk of Virus among people with chronic diseases [6].

Increasing association between Blood group A and SARS CoV-2 Initial reports on COVID-19 suggested that there is a link between ABO blood group system and sensitivity to severe respiratory infection by coronavirus [5,7,8]. The meta-analysis and systemic review were conducted by Nanyang Liu to investigate the association of ABO blood groups with increasing COVID-19 spread. A and B blood group individuals are at higher risk of COVID-19 but not case for AB. Blood group O blood group individuals were at low risk of COVID-19 [9].

Angiotensin-converting enzyme 2 is an enzyme that attached to the membrane of cell and provides a site for binding to SARS-CoV-2 and entre in to cell [10]. The enzyme that helps in the adhesion of corona virus to S protein is angiotensin-converting enzyme 2. It is specifically blocked by natural anti A antibodies. These anti-bodies disturb the interaction between the corona virus and host receptor by creating a safe mechanism [4]. A study by Zhao, et al. say that COVID-19 has a greater effect on blood group A as compare to blood group O [11]. Further assessment of this data was coordinated by antibodies, portraying blood bundles as against A (blood packs B and O) and antagonistic to B (blood packs A and O),

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and suggested that foe of antibodies was less associated with COVID-19 [12]. There was no affiliation found between antibodies present and the danger of COVID-19. We saw that people with against A antibodies were at higher potential outcomes of testing positive for COVID-19, regardless this finding was not really essential. This finding denies that by Gerard , et al., who found that enemy of A was associated with a far and away lower hazard of contamination. A really authentic assessment recommends that maybe the relationship not lies in the sort of antibodies but in degrees of antibodies, where COVID-19 patients were found to have essentially lower levels than asymptomatic controls [13]. According to a study conducted in Turkey, there was no clear difference between ABO blood groups [14]. It is noted by experiments that Rh+ group has a greater chance of COVID-19 but Rh- group is considered to be protective [15].

### Association between blood group B and Corona viruses

The recurrence of blood group B among COVID-19 contaminated individuals had been accounted for to be somewhere in the range of 17.01% and 30.93%. At the point when we joined these outcomes utilizing an irregular impact model ( $I^2 = 79.1\%$ ,  $Q = 28.70$ ,  $p < 0.001$ ), the absolute recurrence of blood group B among all COVID-19 contaminated individuals were assessed as 24.99% (95% CI, 20.35-29.62). Only two examinations contrasted patients and without blood group B in term of the chances of COVID-19 disease. Both showed lower chances of death among individuals with blood group B [16]. *In vitro*, the counter An immune response, found in people with blood bunch O or B, seems to threaten the communication between SARS-CoV-1 and the receptor for angiotensin changing over catalyst 2 (ACE2), which is communicated by have target cells [12]. Cellular models have suggested an explanation, which is evidencing that spike protein/Angiotensin-converting enzyme 2 (ACE2)-dependent adhesion to ACE2- expressing cell lines was inhibited by monoclonal or human anti-A antibodies, so individuals with non-A blood types, specifically O, or B blood types, which produce anti-A antibodies, may be less sensitive to get acute respiratory syndrome coronavirus 2 (SARS-CoV-2) due to the inhibitory effects of anti-A antibodies [17].

### Effect of Ab blood group on SARS-CoV-2

The blood groups were thought to have an effect on SARS-CoV-2 infection and clinical outcomes. A detailed study of 715 articles was made which were taken from seven different databases. They went through meta-analysis and screening. The results showed that blood group AB doesn't affect the rate of infection in Covid patients nor does it have any effect on the mortality rate [9]. In another study, around 31,100 samples were collected and infectivity rates in accordance with the blood groups were studied in detail. The results claimed that individuals inhabiting blood group AB have a higher rate of severity of these infections. In addition, the demise rate was also high in patients with AB blood groups than patients with other blood groups [18].

Moreover, as SARS-CoV-2 is a respiratory syndrome, so

against the attack of virus, the effect of anti-A antibodies was observed that may relate to this infection. This was done to mark effect of blood groups on Covid infection. Data was collected pertaining to ICU extension, sex, age, dates of symptoms, CRRT (continuous renal replacement therapy). The studies showed that AB blood group patients require a higher proportion of mechanical ventilation. Their ICU stay was much long as compared to patients with other blood groups. So, the mechanical ventilation requiring probability was more in such patients. The requirement of mechanical ventilation. CRRT and prolonged ICU admission is higher in critically ill patients with blood group AB than with other groups [19].

Association of Blood Group O and SARS-CoV-2 The instant global spread of the coronavirus SARS-CoV-2 in China and its rapid international and national spread pose a worldwide health emergency [20]. Researches have proved the relation between various blood groups and SARS-CoV-2 [7]. Like ABO blood group system, Rh type also plays a key role in providing immunity against SARS-CoV-2 [21].

A comparison has revealed that individuals with blood group O had a lower risk of infection compared to non-O blood groups and Rh+ blood was associated with higher odds of testing positive [22]. A genetic testing company released the data of its ongoing research in which some people were intentionally exposed to virus and are compared with the normal population. In the normal population, people with O blood type were 9-18% less likely to test positive compared to the other non O blood types [19]. When looking at individuals exposed to corona, people with O blood group were 13-26% less likely to test positive. The percent of respondents reporting a positive test for COVID-19 was highest among those with the AB blood type and was lowest for people who are O blood type [23]. Rh- status seemed protective against SARS-CoV-2 infection. O, Rh-, and O- blood groups were the most protective in individuals younger than age 70 [24]. Like SARS-CoV the mechanism of SARS-CoV-2 infection also depends on spike protein as it utilizes angiotensin-converting enzyme 2 (ACE2) as receptor for cell entry and several other host proteases also help the virus to invade the cells more efficiently [25-27].

### Protection of O blood type against SARS

Blood O type is most protective against the development of cardiovascular diseases and severe COVID -19 as it contains lower level of angiotensin-converting enzyme (ACE) whereas blood A type is positively associated with ACE activity [28]. It contains both anti-A and anti-B antibodies that prevent the entry and the attachment of the virus to ACE2 receptors [29]. The anti-A antibodies is the main antibody that prevent the adhesion of SARS-CoV-2 spike to ACE2 receptor which is present on the cell surface. The protection of anti-A antibody in O blood group was high as compared to anti-A antibodies in B blood group [11]. So, blood group O is more protective. The entry of virus into the cell involves the pre-activation of the S protein by the protein convertase furin or furin-like proteases and due to lower efficiency of furin cleavage in blood group O individuals they are protective against virus [30].

Effect of COVID-19 on Pregnant Women and Relationship with Blood Groups Corona virus is a harmful disease and pandemic due to which there is a rapid increase in cases which effect on lungs and if the effect on lungs is severe then it causes death. From 2019 to 2020 the deaths are at least 250,000. But the pregnant women are at high risk of getting this disease because its immune system is somehow weak as they provide the protection, food, antigens, antibodies to the fetus in their womb [31]. First trimester pregnant women are suffered with COVID-19 had voluntary miscarriages and these cases are mostly 4 of 7 [32]. First trimester pregnant women are suffered with COVID-19 had voluntary miscarriages and these cases are mostly 4 of 7 [33]. Women with second and third trimester had high risk of fetal mortality or ICU admission and miscarriages, premature birth happened sometime but not any risk of transference of COVID-19, however mother may be faced respiratory problems as compared to non-pregnant effected women [34-36]. COVID-19 inflicts stress and depression on the minds of pregnant women which in result effect fetus growth [37].

COVID-19 Effect According to Blood Group on Pregnant Women The pregnant women having blood group A or having Rh-negative have the high risk of getting this disease [38]. And, O blood group have a very low risk of getting COVID-19 so fetuses of O blood group mothers are safe [29]. Rh -ve pregnant women were not suffered with COVID-19 at higher rate but Rh +ve pregnant women are more effected [39].

### Mortality rate of COVID-19 patients

The mortality rate of COVID-19 widely depends upon ventilator performance, ICU facility, disease characteristics, experience of hospital team and the geographical area characteristics. The, mortality rate of COVID-19 patients varies from (20% to 97%) in different areas of world. According to a preliminary report there is a great connection between ABO blood group and susceptibility to SARS covid-2 infection [7]. *In vitro*, the counter A resistant reaction, found in blood group O or B of individuals, appears to indicate the relation between SARS-CoV1 and the receptor for angiotensin changing over compound 2 (ACE2), which is conveyed by have target cells [12]. Given that SARS-CoV-2 moreover binds to ACE2 [11,26]. Multiorgan tropism of SARS-CoV-2 can aggravate the infection and severity [40]. A critical analysis was done on the patients of COVID-19 by using the inflammatory cytokines of the ill patients. In addition, we are in search of country wide population ABO blood group distribution record. The aim of current study is to investigate the severity of SARS-CoV-2 among people of different ABO blood groups depending upon the different serums present in the organs or other products used in clinics like ventilators CCRT or the maintain in ICU [41-43].

### Conclusion

Different blood groups respond to SARS-CoV-2 infection differently with A, B and AB blood group posing higher risk of infectivity, increased mortality rate and prolonged treatment respectively. While, O blood group provides patients with protective mechanism. Moreover, weak immune system

makes pregnant women more susceptible to it especially A and Rh negative. But, it is to be noted mutations are taking place in this virus with time.

### References

- Chen L, Liu W, Zhang Q, et al. (2020) RNA based mNGS approach identifies a novel human coronavirus from two individual pneumonia cases in 2019 Wuhan outbreak. *Emerg Microbes Infect* 9: 313-319.
- (2020) Coronavirus disease (COVID-19) pandemic. WHO.
- (2020) Coronavirus disease (COVID-19) Situation Report – 134. WHO.
- Zhao J, Yang Y, Huang H, et al. (2020) Relationship between the ABO Blood Group and the COVID19 Susceptibility. *medRxiv*.
- Li J, Wang X, Chen J, et al. (2020) Association between ABO blood groups and risk of SARS-CoV2 pneumonia. *Br J Haematol* 190: 24-27.
- Chen N, Zhou M, Dong X, et al. (2020) Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: A descriptive study. *Lancet* 395: 507-513.
- Zhao J, Yang Y, Huang H, et al. (2021) Relationship between the ABO blood group and the Coronavirus Disease 2019 COVID-19 susceptibility. *Clin Infect Dis* 73: 328-331.
- Zietz M, Tatonetti NP (2020) Testing the association between blood type and COVID-19 infection, intubation, and death. *MedRxiv*.
- Liu N, Zhang T, Ma L, et al. (2021) The impact of ABO blood group on COVID-19 infection risk and mortality: A systematic review and meta-analysis. *Blood reviews* 48: 100785.
- Lu R, Zhao X, Li J, et al. (2020) Genomic characterisation and epidemiology of 2019 novel coronavirus: Implications for virus origins and receptor binding. *Lancet* 395: 565-574.
- Gérard C, Maggipinto G, Minon, JM (2020) COVID-19 and ABO blood group: another viewpoint. *Br J Haematol* 190: e93-e94.
- Guillon P, Clément M, Sébille V, et al. (2008) Inhibition of the inter- action between the SARS-CoV spike protein and its cellular receptor by anti-histo-blood group antibodies. *Glycobiology* 18: 1085-1093.
- Deleers M, Breiman A, Daubie V, et al. (2021) Covid-19 and blood groups: ABO antibody levels may also matter. *Int J Infect Dis* 104: 242-249.
- Arac E, Solmaz I, Akkoc H, et al. (2020) Association between the Rh blood group and the Covid-19 susceptibility. *UHOD-Int J Hematol Oncol* 30: 81-86.
- Ellinghaus D, Degenhardt F, Bujanda L, et al. (2020) Genomewide Association study of severe Covid-19 with respiratory failure. *NEJM*.
- Pourali F, Afshari M, Alizadeh-Navaei R, et al. (2020) Relationship between blood group and risk of infection and death in COVID-19: A live meta-analysis. *New Microbes New Infect* 37: 100743.
- Zhang Y, Garner R, Salehi S, et al. (2021) Association between ABO blood types and coronavirus disease 2019 (COVID-19), genetic associations, and underlying molecular mechanisms: A literature review of 23 studies. *Ann Hematol* 100: 1123-1132.
- Wu BB, Gu DZ, Yu JN, et al. (2020) Association between ABO blood groups and COVID-19 infection, severity and demise:

- A systematic review and metaanalysis. *Infect Genet Evol* 84: 104485.
19. Hoiland RL, Fergusson NA, Mitra AR, et al. (2020) The association of ABO blood group with indices of disease severity and multiorgan dysfunction in COVID-19. *Blood Adv* 4: 4981-4989.
  20. Hoffmann M, Kleine-Weber H, Schroeder S, et al. (2020) SARS-CoV-2 Cell Entry Depends on ACE2 and TMPRSS2 and Is Blocked by a Clinically Proven Protease Inhibitor. *Cell* 181: 271-280.
  21. Sandler SG, Chen LN, Flegel WA (2017) Serological weak D phenotypes: A review and guidance for interpreting the RhD blood type using the RHD genotype. *Br J Haematol* 179: 10-19.
  22. Latz CA, DeCarlo C, Boitano L, et al. (2020) Blood type and outcomes in patients with COVID-19. *Ann Hematol* 99: 2113-2118.
  23. (2020) 23andMe finds evidence that blood type plays a role in COVID-19. 23andMe Blog.
  24. Ray JG, Schull MJ, Vermeulen MJ, et al. (2021) Association between ABO and Rh Blood Groups and SARS-CoV-2 infection or severe COVID-19 illness: A population based cohort study. *Ann Intern Med* 174: 308-315.
  25. Zhou P, Yang XL, Wang XG, et al. (2020) A pneumonia outbreak associated with a new coronavirus of probable bat origin. *Nature* 579: 270-273.
  26. Kuba K, Imai Y, Rao S, et al. (2005) A crucial role of angiotensin converting enzyme 2 (ACE2) in SARS coronavirus-induced lung injury. *Nature Medicine* 11: 875-879.
  27. Zhang H, Penninger JM, Li Y, et al. (2020) Angiotensin converting enzyme 2 (ACE2) as a SARS-CoV-2 receptor: Molecular mechanisms and potential therapeutic target. *Intensive Care Med* 46: 586-590.
  28. Dai X (2020) ABO blood group predisposes to COVID-19 severity and cardiovascular diseases. *Eur J Prev Cardiol* 27: 1436-1437.
  29. Cheng Y, Cheng G, Chui CH, et al. (2005) ABO blood group and susceptibility to severe acute respiratory syndrome. *JAMA* 293: 1450-1451.
  30. Pendu JL, Breiman A, Rocher J, et al. (2021) ABO blood types and COVID-19: Spurious, Anecdotal, or Truly Important Relationships? A reasoned review of available data. *Viruses* 13: 160.
  31. Wang CL, Liu YY, Wu CH, et al. (2021) Impact of COVID-19 on Pregnancy. *Int J Med Sci* 18: 763-767.
  32. Gaunt G, Ramin K (2001) Immunological tolerance of the human fetus. *Am J Perinatol* 18: 299-312.
  33. Wong SF, Chow KM, Leung TN, et al. (2004) Pregnancy and perinatal outcomes of women with severe acute respiratory syndrome. *Am J Obstet Gynecol* 191: 292-297.
  34. Lam CM, Wong SF, Leung TN, et al. (2004) A case controlled study comparing clinical course and outcomes of pregnant and non-pregnant women with severe acute respiratory syndrome. *BJOG* 111: 771-774.
  35. Yan J, Guo J, Fan C, et al. (2020) Coronavirus disease 2019 (COVID-19) in pregnant women: A report based on 116 Cases. *Am J Obstet Gynecol* 223: 111.e1-111.e14.
  36. Karimi-Zarchi M, Neamatzadeh H, Dastgheib SA, et al. (2020) Vertical transmission of Coronavirus disease 19 (COVID-19) from infected pregnant mothers to neonates: A review. *Fetal Pediatr Pathol* 39: 246-250.
  37. Ghazanfarpour M, Bahrami F, Fakari FR, et al. (2021) Prevalence of anxiety and depression among pregnant women during the COVID-19 pandemic: A meta-analysis. *J Psychosom Obstet Gynaecol* 1-12.
  38. Covali R, Socolov D, Pavaleanu I, et al. (2021) SARS-CoV-2 infection susceptibility of pregnant patients at term regarding ABO and Rh blood groups: A cohort study. *Medicina (Kaunas)* 57: 499.
  39. Ibrahim SA, Boudova S, Rouse CE, et al. (2021) 975 ABO blood group, rhesus type and risk of COVID19 in pregnant women. *Am J Obstet Gynecol* 224: S605.
  40. Puelles VG, Lütgehetmann M, Lindenmeyer MT, et al. (2020) Multiorgan and renal tropism of SARS-CoV-2. *N Engl J Med* 383: 590-592.
  41. Chen T, Wu D, Chen H, et al. (2020) Clinical characteristics of 113 deceased patients with coronavirus disease 2019: Retrospective study. *BMJ* 368: m1091.
  42. Zhou F, Yu T, Du R, et al. (2020) Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *Lancet* 395: 1054-1062.
  43. Stukas S, Hoiland RL, Cooper J, et al. (2020) The association of inflammatory cytokines in the pulmonary pathophysiology of respiratory failure in critically ill patients with COVID-19. *Crit Care Explor* 2: e0203.

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