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# ABO Blood Group and Associated Coronavirus Disease (COVID-19)

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## ABSTRACT

Coronavirus disease (COVID-19) or (SARS-CoV-2) is a pandemic disease represents a public health crisis that causes actual morbidity and mortality. The disease characterized by respiratory infection and spread worldwide after an outbreak initiated in Wuhan, China, in December 2019. The novel coronavirus disease has been spreading around the world rapidly and declared as a pandemic by WHO. Our aim in this meta-analysis of many different studies to find out the susceptibility of infection by COVID-19 and individuals having specific ABO blood group. This systematic review and meta-analysis covered most of the comparison of many studies carried out since Marsh 2019 up to May 2021, and indicated that blood group A and B was associated with an increased risk of infection (susceptibility) or death (severity), whereas blood group O appears to be protective and associated with a decreased risk of infection or death.

***Keywords:*** COVID-19, SARS-CoV-2, ABO blood group, disease susceptibility

## INTRODUCTION

In December 2019, a new type of coronavirus was detected in Wuhan province, China, causing a severe respiratory failure called COVID-19. SARS-CoV-2, which genetically linked to SARS-CoV-1 and MERS-CoV, two other human coronaviruses that have caused severe lower respiratory tract infections in China in 2002–2003 and in the Middle East since 2012, respectively [1]. On March 2020, the World Health Organization has declared that the COVID-19 infection a global pandemic [2]. In June 2020, the infection has affected more than 200 countries all over the world, resulting in a global disaster which reached over 10.3 million cases and a death toll of more than 506,000 [3]. SARS-COV-2 is a β-coronavirus that is highly similar homologous to SARS-CoV and uses angiotensin-converting enzyme 2 (ACE2) during transmission [4]. Recent clinical research observed suggests that patient age, male sex and certain chronic medical conditions (e.g., cardiovascular disease, diabetes, COPD) may represent a risk for the infection of SARS-Cov-2 and higher disease severity [5].

The ABO blood group system was the first human blood group, which discovered by Landsteiner in 1901 [6]. Since then, studies on the relationship between the ABO blood group system and various diseases have never ceased, because it is inherent in humans and easily determinable [7]. The likely relationship between infectious agents and ABO blood antigens is linked to its carbohydrate moieties on RBC surface. This structure may function as a receptor for some viruses, bacteria, and parasites and mediate their entrance [8]. There for we focused in this study to emphasis the association and relationship between COVID-19 infection and individuals having specific ABO blood group.

## MATERIALS & METHODS

**Research Methods & Reporting:**

I collected the data for this review from different researches in most of them they used in their method and reporting the Preferred Reporting Item for Systematic Review and Meta-analysis Protocol (PRISMA) and Meta-analysis Of Observational Studies in Epidemiology (MOOSE) recommendations. The others they collected their data directly from existing patient-level data sets for all hospitalizations or from The Ministry of Health's Registered Persons Database.

## RESULT and DISCUSSION

There are some studies [1–9] (Table 1) have analyzed the relationship between blood group and coronavirus disease 2019 (COVID-19) susceptibility and clinical outcomes. The number, 1 2 and 5 done in china, No. 3 at seven hospitals in the Italian and Spanish epicenters of the SARS-CoV-2 pandemic in Europe. The study No. 4 in New York Presbyterian (NYP) hospital, No.6, 7 done in USA in different institutions, No. 8 by Shizuoka Medical Center, Shizuoka Japan, finally the study No. 9 carried out in April 2020 on the French Navy nuclear aircraft carrier "Charles de Gaulle". This only study found that no relationship between ABO blood groups and coronavirus disease 2019.

All the studies found that blood group A was associated with an increased risk of infection (susceptibility) or death (severity), whereas group O was associated with a decreased risk of infection or death except the No 9, as he shown in his table (1) [9-17].

**Table 1. Studies that evaluated the relationship between ABO blood groups and coronavirus Disease 2019**

| Study | Study Design | Coronavirus Disease 2019 Cases | Susceptibility (Infection) | Severity (Death) |
|---|---|---|---|---|
| 1- Zhao et al [9] | Retrospective: case control | 2173 | Decreased risk for blood type O; increased risk for blood type A | Decreased risk for blood type O; increased risk for blood type A |
| 2- Fan et al [10] | Retrospective: case control | 105 | Increased susceptibility for females with blood type A | Not evaluated |
| 3-Ellinghaus et al [11] | Retrospective: case control | 1980 | Decreased risk for blood type O; increased risk for blood type A | No relationship |
| 4- Zietz and Tatonetti [12] | Retrospective: case control | 2206 | Decreased risk for blood type O; increased risk for blood type A | No relationship |
| 5- Li et al [13] | Retrospective: case control | 265 | Decreased risk for blood type O; increased risk for blood type A | No relationship |
| 6- Leaf et al [14] | Retrospective: cohort | 3239 | Not evaluated | No relationship |
| 7- Latz et al [15] | Retrospective: cohort | 1289 | Decreased risk for blood type O; increased risk for blood types B and AB | No relationship |
| 8- Takagi [16] | Retrospective: nation-level epidemiological design | 8.9 million | No relationship | Decreased risk for blood type 0-Rh(+) |
| 9- Boudin et al [17] | Retrospective: cohort | 1279 | No relationship | No relationship |

A study had done in September 2020 in Spain; compared ABO distributions in infected patients with COVID-19. They observed a significant difference in the ABO blood group distribution (p=0.0023): blood group A was more common among infected patients, standing at the limit of statistical significance (OR: 1.13; 95% CI: 0.99-1.29; p=0.069), and group O was significantly less prevalent. The risk of mortality in COVID-19 patients in blood group A was significantly higher than that of patients in blood group O [18].

There was Population-based cohort study had done in Ontario, Canada by Joel G. Ray; Michael J. Schull. et al, concluded that the O and Rh negative blood groups may be associated with a slightly lower risk for SARS-CoV-2 infection and severe COVID-19 illness [19].

## CONCLUSION

In conclusion, this meta-analysis gives great evidence that blood groups A and B are highly associated with an increased risk of COVID-19, whereas blood group O appears to be protective. On the other hand, the Rh-positive individuals are more susceptible to COVID-19 than Rh-negative individuals are. Moreover, individuals with blood group A are not only susceptible to developing the disease but also show unfavorable outcomes.

### *Declaration by Authors*

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**Conflict of Interest:** The author declares no conflict of interest.

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