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Opinion

Corona Covid-19 virus and severe hypoxia in young patients without underlying disease: High prevalence rate with blood group A

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1. Background

Corona covid-19 virus is known as a pandemic disease around the world. The contagious spreading of this virus can cause negative social and economic effects on communities. Hypoxia is one of the catastrophic complications of this virus which could lead to perform endotracheal intubation and invasive ventilation. This event would be more regretful, if a young immunocompetent male or female without underlying disease is involved. To our knowledge, this is the first report regarding the relation between type of blood group and Covid-19 infected patients who are young with no underlying disease and no history of taking medication but suffer from sever hypoxia.

According to the previous studies, hydroxychloroquine has been shown in some extent to be effective against corona virus [1]. This medication is also being used for the treatment of different types of malaria [2]. On the other hand, some types of blood group are more susceptible to be infected by malaria [3]. This prompted us to explore the relation between the type of blood group and severe cases of hypoxia among young patients infected by Covid-19.

2. Methods

From March 1, 2020 through to April 20, 2020, we have reviewed three hospitals of Corona virus care centers in Tehran, Iran; and selected 93 hospitalized patients with hypoxia who were diagnosed infected by Covid-19. The diagnosis of hypoxia was based on existence of both RT-PCR positive test and the special pattern of ground glass for Covid −19 in pulmonary CT-Scan for those people hospitalized in the intensive care unit (ICU) with upper or lower respiratory signs and symptoms. They were all younger than 45 years old, with no underlying disease and no history of getting immunosuppressive medications such as corticosteroids and chemotherapy agents during the last 12 months. Severe hypoxia was defined as spo 2<80% and resistant to respond to the all of the non-invasive modalities such as oxygen with reservoir bag, high flow oxygen, bi-level positive airway pressure (BiPAP), medications such as IVIG, interferon's, immunosuppressive and anti-viral agents; therefore, we had no treatment option other than endotracheal intubation to begin invasive ventilation.

3. Results

Of 93 patients with severe hypoxia, 61 (65%) patients had blood group type A, 22 (23%) patients had AB, 8 (8%) patients had type B, and only 2 (2%) of patients had blood group type O. In the general population, in our community the distribution of the blood group reported the blood of 36.49%, 32.09%, 23.68%, and 7.74% as type O, A, B and AB respectively [4].

4. Discussion

According to this data, the blood of 36.49% of our general population is type O versus 2% in our sample and 32.09% of our general population is type A versus 65% in our sample. Although certain studies have shown that blood group type A are at higher risk of being infected by corona covid-19 and cardiovascular diseases [5,6],

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in our study the high association between blood group type A and severe hypoxia which needs invasive ventilation has been demonstrated for younger patients without underlying disease and with no history of drug consumption. This finding indicates that blood group type A is usually more susceptible to be involved by severe form of the Covid-19. We hypothesize that the protein that defines type A and B blood might affect the immune system's production of antibodies, perhaps these blood types have a slower immunity as a result. The genes that determine blood type might also have something to do with the ACE2 receptors that the corona virus uses to infect human cells. Although the pathophysiology of hypoxia in covid-19 has not been completely understood yet, Sars-Covid-2 corona virus attacks hemoglobin on the red blood cells through a series of cellular actions, that ultimately renders the RBCs incapable of transporting oxygen to the cells [7]. This mechanism of action of Covid-19 may be similar for covid-2 and the structural similarity between Covid-19 and human protein such Hemoglobin type A, such that antibodies and T cells activated in response to the exogenous agent react with the human protein which in turn could lead to severe hypoxia.

According to the study conducted by Ellinghaus et al., a novel susceptibility locus at a chromosome 3p21.31 gene cluster with a possible enrichment in patients with severe disease and a potential involvement of the ABO blood-group system in Covid 19 were detected [8]. The biologic mechanisms undergoing these findings may have to do with the ABO group per se. It is realized with the development of neutralizing antibodies against potential-linked n-glycans [9] or with other biologic effects of the identified variants [10] including the stabilization of Von Willebrand factor [11,12]. The ABO locus holds considerable risk for population stratification [13] which is increased by the inclusion of randomly selected blood donors [8].

Although we conducted this study in a small sample size, this study assessed only young hospitalized patients in the ICU with no underlying disease.

In the current study among 93 patients with severe hypoxia who were managed using invasive ventilation, only two patients (2%) had blood group type O and they were health workers that had a history of exposure to several infected patients with no standard protection. This fact could also bring up the proposal of high viral load that has entered the respiratory system in a short period of time and could lead to a severe disease, even in patients with blood group type O. Thus, antigen A located on RBC may be a major target of Corona Covid-19 virus or the target of human inflammatory cytokines and those with no antigen such as group O are not at this risk as compare to the blood group A, AB and B. These data warrant further studies so that we can enhance our understanding of the other unknown mechanisms which may exist behind hypoxia caused by the Covid-19 virus.

Declaration of competing interest

The authors of this manuscript do not have commercial or any other associations that might pose a conflict of interest. The authors also did not have any source of financial support or grant for this brief report.

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