ISSN (print): 2589-9120
ISSN (online): 2589-9139

International Journal of Medical Science and Applied Research (IJMSAR)

Available Online at: https://www.ijmsar.com

Volume – 3, Issue –5, September – October - 2020, Page No. : 79 – 82

COVID-19 And Blood Grouping - An Overview

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Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Variations in the blood group antigen can increase and relationship between ABO blood grouping and COVID-19 severity has remained unresolved, despite more recent investigations. Blood group A is associated with higher risk for acquiring COVID-19 compared to non-A blood groups, whereas blood group O is associated with lower risk for the infection compared to non-O blood groups. Individuals with blood group O have higher interleukin 6 (IL-6) levels and are playing vital role in cellular defence in the acute phase especially associated with COVID-19 severity. Higher levels of AST, ALT and peak serum creatinine in patients with A and AB indicated multiorgan involvement. The elevation of fibrin D dimers in patients with A and AB than O group, because pulmonary vasculopathy and coagulopathy are increasingly recognized clinical pathophysiological sequelae, where O group have reduced levels of factor VIII accounting in the underlying protection.

Keywords: COVID-19, ABO blood grouping, IL-6, hepato-renal biochemistry, fibrin D dimers, factor VIII.

Corona viruses (CoVs) are enveloped single stranded RNA virus harboring 25 to 33 kilobases of genome. The name Corona is designated after the electron microscopic observations and viewed like crown. The structural proteins that are largely found are haemagglutinin esterase, internal, membrane, nucleocapsid and small membranes. Based on the variations in the protein sequences, the classification of CoVs are of four genera including alpha, beta, gamma and delta CoV [1,2,3].

In nature, the alpha and beta CoVs are evidenced among bats and rodents whereas gamma and delta are found among birds; further crossed the species barriers and emerged as human CoVs (HCoVs) [1,4,5]. There are seven HCoVs recognized, among them two are grouped as alpha CoVs (HCoV-229E and HCoV-NL63) and five as beta (HCoV-OC43, HCoV-HKU1, severe acute respiratory syndrome CoV (SARS-CoV), Middle East respiratory syndrome CoV (MERS-CoV) and SARS-CoV2 [6,7].

Initially, the 2019-nCoV causes an ongoing outbreak of lower respiratory tract disease called novel coronavirus pneumonia (NCP) by the Government of China [8]. Later, international committee on taxonomy of viruses (ICTV)

announced "severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) as the name of the new virus on 11 February 2020. WHO announced COVID-19 as the name of this new disease on 11 February 2020 following guidelines developed with the World Organization of Animal Health (OIE) and the Food and Agriculture Organization of the United Nations (FAO) [9].

The pathogenesis of severity of COVID-19 and the associated respiratory disorders and failure are still to be educated, but risk factors for morbidity and mortality is observed predominantly among male, older age, obese, diabetes, hypertension, asthma, cardiovascular diseases and other medical complications.

The polymorphic traits inherited among individuals are closely associated with the blood group antigens. Currently there are thirty four human blood groups and more than hundreds of blood group alleles and antigens were recognized. The variations in the expression of blood group antigen can increase and relationship between ABO blood grouping and COVID-19 severity has remained unresolved, despite more recent investigations [10].

The blood group A is associated with higher risk for acquiring COVID-19 compared to non-A blood groups, whereas blood group O is associated with lower risk for the infection compared to non-O blood groups [11,12,13]; death for AB blood group was non significant, it was considerable [14]. The blood cell surface structures might influence the susceptibility of the cell to be infected by the COVID-19 [15].

Patients with blood group A, B and AB are most likely to test positive whereas blood type O was less likely to test positive [16]. This indicated certain ABO blood groups were correlated with COVID-19 susceptibility and some clinical characteristics of patients with COVID-19 [11]. A study with 95 critically ill COVID-19 patients found that blood groups of them with A and AB are more likely to require mechanical ventilation, higher lung injuries, dialysis for kidney failure. These blood group patients have an increased risk of organ dysfunction or failure, longer overall hospital stay and remain the intensive care unit for longer average time provide greater signal COVID-19 severity level [17]. Comparative analysis of clinical features of COVID-19 with ABO blood grouping was tabulated (Table 1).

Table 1: ABO blood grouping and clinical features of COVID-19 patients.

Clinical features	Duration	Percentage	Blood grouping			
			A	B	AB	O
Incubation period - Asymptomatic	5 days	-	Symptom-atic	Asympto-matic	Symptom-atic	Asympto-matic
Mile symptoms - fever, fatigue, dry cough, ground glass opacity, pneumonia	6 to 10 days	81	Maximum	Moderate	Maximum	Minimum
Severe - Dyspnea, Co-existing illness and ICU needed	7 to 14 days	14	Maximum	Moderate	Maximum	Minimum/ Nil
Critical/ Deceased - ARDS, acute cardiac injury, MOD - MOF	12 to 20 days	5	Prevalent	Probable	Possible	Nil

[ICU - Intensive care unit; ARDS-Acute Respiratory Disease Syndrome;
MOD - Multiorgan Dysfunction; MOF - Multiorgan Failure]

By nature, the individual with blood group O have higher interleukin 6 (IL-6) levels [18]. Biosynthesis of this IL6 is possible through various cells which play a vital role in cellular defence in the acute phase especially associated with COVID-19 severity, as it can be part of a cytokine storm [19]. IL6 has dual role in lung repair responses and exacerbate its role in COVID-19 infection [19,20,21,22].

There are some theoretical and field based observations related to ABO blood grouping and COVID-19; for getting the reliable concept, meta analysis of preliminary studies will be done thereby valid estimate will be determined. Many studies suggested the less vulnerability of O group but cannot find any significant difference in the rate of infection between A, B and AB groups.

The demonstration related to higher levels of AST, ALT and peak serum creatinine in patients with A and AB

indicate multiorgan involvement of COVID-19 infection [23]. Interestingly, it was found that elevation of fibrin D dimers in patients with A and AB than O group, because pulmonary vasculopathy and coagulopathy are increasingly recognized clinical pathophysiological sequelae of COVID-19 that resulted in respiratory failure and related chronic morbidity. Particularly, O group have reduced levels of factor VIII accounting in the underlying protection against the development of vasculopathy within the pulmonary vasculature and other important organ vascular beds [24,25,26,27].

As a conclusion, we find out the severity effect of blood type on COVID-19, where O type has lower risk of contracting the virus. Shortly, we aim to tease out the effect of blood group and COVID-19 on other vital organs.

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