Understanding the Role of HDL during COVID-19 Infection

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Abstract: Background: Recently emerged COVID-19 pandemic has caused a large number of deaths with a lack of confirmed cases worldwide posturing a grim situation and severe threat to public health. There is an imperative necessity of analyzing emerging clinical and laboratory data of COVID-19 patients, which may contribute to elucidate the pathogenic mechanism and development of effective prevention and treatment countermeasures.

Methods: Under this article, the emerging role of High-Density Lipoprotein (HDL) was analyzed by collecting recently published articles related to this field having clinical data of COVID-19 patients.

Results: Based on the recently published reports of laboratory-confirmed COVID-19 infected hospitalized patients it was consistently observed that levels of HDL were low at the time of admission to hospital and remained relatively low during the disease course i.e., treatment, recovery, and discharge stage. It was also reported critically that levels of HDL in the patients, those did not survive, decreased continuously until death.

Conclusion: These clinical reports of patients have risen the concern about probable infection and worsen the clinical outcome of a healthy person having a compromised level of HDL for COVID-19 infection. Eventually, these findings stated that there is a strong association of low HDL levels with a higher risk of COVID-19 infection and further severity of the illness. Proper attention is needed to understand the significance of altered quantity and quality of HDL in COVID-19 patients compared to healthy controls, so that appropriate therapies could be given at the right time to combat severity and mortality due to this infection.

Keywords: Cholesterol, COVID-19, high density lipoprotein (HDL), risk, pathologies, infection

1. INTRODUCTION

COVID-19 infection caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has spread rapidly throughout the world. Its clinical manifestation ranges from the mild to critically ill cases and the patient’s clinical data is of vital importance to the mankind to improvise diagnosis and treatment in order to diminish mortality. Due to lack of prior immunity to this novel coronavirus, clinicians worldwide are facing problems as there are no proven clinical predictors and therapies. Based on the recent reports available on COVID-19 infected hospitalized patients, it has been observed that the levels of HDL are low at the time of admission to hospital and remain relatively low during the course of treatment and even at the recovery stage. It has been further reported that the levels of HDL in the patients, those who did not survive, decreased continuously until death. These findings indicate that there could be a strong association of low HDL levels with a higher risk of COVID-19 infection and further severity of the illness. The aim of this brief report is to consolidate the information available so far on significance of HDL and its protective role in relation to the COVID-19 propensity.

2. BRIEF REPORT

Previous studies have demonstrated that the composition of lipoprotein and lipids are significantly altered during the infection. Triglyceride and VLDL cholesterol tend to increase while HDL cholesterol (HDL-C) and LDL cholesterol (LDL-C) levels tend to decline during infection [Pirillo et al. 2015]. Endotoxemia affects the size of HDL particle and its composition, phospholipids and apolipoprotein (apo) A-I are reduced while serum amyloid A (SAA) and secretory phospholipase A2 (sPLA2) increase dramatically. Thus, total number of HDL particles does not change, a significant decrease in the number of small and medium-size particles is observed. Lowered HDL levels directly correlate with an exaggerated systemic inflammatory response and inversely with severity of the septic disease [1].

Protein and lipid constituents of the HDL particle possess several proven biological properties such as inhibiting oxidation and inflammation, protection against endothelium dysfunction, coagulation activation inhibition, and re-
roducing platelet aggregation. These properties of HDL constitute a protective role against various infections and pathological conditions. Available clinical data of coronavirus infected patients have raised concern about the link between people at risk of COVID-19 infection and its poor prognosis to compromised levels of the HDL. Although more clinical data is required to establish the role of HDL as an important clinical predictor/indicator of COVID-19 infection severity. However, there are few reports which demonstrate the same. From the recent studies of laboratory confirmed COVID-19 infected patients, common observations were depicting that levels of HDL were low from the time of admission to hospital till discharge [2-5]. Collectively, observations from the available reports indicate that there is a possibility of a strong association between the low HDL levels with a higher risk of COVID-19 infection and its further severity.

We came across an interesting report by Fan and co-workers who performed a retrospective longitudinal analysis of COVID-19 patients (n = 21) who were admitted at Zhongnan Hospital, Wuhan, China between January 18 and February 8, 2020 [2]. Their study also included those patients who had undergone a routine laboratory test including lipid levels in same hospital between January 9 and 17, 2020, before they tested positive for SARS-CoV2 infection. Healthy subjects (n = 31) and patients having chronic obstructive pulmonary disease (COPD, n = 21) who had lipid profiles available with hospital (between the month of September 2019 to October 2019) were included in the study as normal and non-infected COVID-19 controls. They observed that HDL levels were significantly decreased at the time of hospital admission (1.1 mmol/L (reference range: 0.8-1.4 mmol/L) as compared to the levels prior to infection: 1.4 mmol/L (reference range: 1.0–1.8 mmol/L) (p=0.03). Thus, a significant difference of the HDL levels in COVID-19 patients exists before and after they succumb to infection. During the course of treatment, after recovery, and till discharge, HDL levels remained relatively low. They further reported that the HDL levels in non-survivors also decreased continuously until death. Another recent report is available from the study on 97 hospitalized COVID-19 confirmed patients, common observations were depicting that levels of HDL were low from the time of admission to hospital till discharge [2-5]. Collectively, observations from the available reports indicate that there is a possibility of a strong association between the low HDL levels with a higher risk of COVID-19 infection and its further severity.

CONCLUSION

Further investigations are needed to get the deep insight into the potential causal role of low HDL levels in viral infection pathologies which will help clinicians to suggest probable strategies to combat present COVID-19 infection and their subsequent pathologies. Due to the complexity of HDL structure and metabolism it can also be expected that multiple pathways might be affected by COVID-19 infection which ultimately leads to the remarkable decline in the HDL levels and eventually may escort to various pathologies like cardiovascular disorders etc. There seems to be a relationship between the low HDL values found during SARS-CoV2 infection and the pathogenesis of the virus. All the available literature shows that individuals affected with coronavirus have altered serum HDL level. Current findings demonstrated the irreversible decrease of HDL levels in COVID-19 patients and its significant association with infection severity and mortality. Critical attention is needed for patients with compromised HDL levels as it may lead to other pathological complications during coronavirus infection. Thus, we suggest that HDL levels should be critically evaluated in large number of COVID-19 patients to vivid this initial link or association of the HDL levels and COVID-19 infection severity.

CONSENT FOR PUBLICATION

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CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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REFERENCES


