

## Deficiency Of Antioxidant Vitamin C And Increase Superoxide Dismutase (Sod) Level in Covid-19 Patients

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### Abstract

**Aim & Objectives:** The aim of this study is to estimate the levels of Vitamin c and Superoxide Dismutase (SOD) in COVID-19 patients and healthy controls.

**Materials And Methods:** In this study, 50 COVID-19 patients and 50 healthy controls of both gender matching in age and sex were included. The analysis of biochemical parameters was done by using autoanalyzer using diagnostic reagent kit.

**Results:** In the present study Mean of Vitamin c was lower in COVID-19 patients than controls ( $P < 0.001$ ) and Superoxide Dismutase (SOD) was higher in COVID-19 patients than controls ( $P < 0.001$ )

**Conclusion:** Significant changes were observed in Vitamin c and Superoxide Dismutase (SOD). They are favorable prognostic biomarkers with high accuracy for predicting the in-hospital mortality in patients with COVID-19.

**Keywords:** Superoxide Dismutase (SOD), oxidative stress (OS), reactive oxygen species (ROS), catalase (CAT)

### Introduction

The COVID-19 is a pandemic caused by SARS-CoV-2 which has infected over 74 million people, killing more than 1,600,000 million people globally as of 17th December 2020.(1) Movement restrictions imposed by countries in order to flatten this curve has also pushed the world economy into a great depression, with an estimated heavy downturn of 5.2% in global gross domestic product (GDP), which is the biggest contraction since 1870, many countries are facing massive uncertainty and the likelihood of some of them going into recession.(2) The disease, which emanate from China in 2019, is caused by the severe acute respiratory syndrome coronavirus 2 (SARSCoV-2), a positive-sense single-stranded RNA

virus(3-5) and is taxonomically a member of the Beta coronavirus genus.(4)

Antioxidants prevent or slow the damage to the cells caused by free radical's reactions. The neutralization activity of radical molecules by antioxidants is achieved through their scavenging power by stopping chain reactions, peroxide decomposition, metal-chelating and induction of antioxidant enzymes. (5) Considerable interest has risen in the idea that oxidative stress (Os) is instrumental in the etiology of numerous human diseases. Os can arise through the increased production of reactive oxygen species (ROS) and/or because of a deficiency of antioxidant

defences and this may further worsen respiratory diseases (COVID-19 inclusive), especially when the level of free radicals are high.(5) Free radicals are natural by-product of aerobic cell metabolism that the body can normally handle, but in the presence of a secondary condition, such as COVID-19, the abnormally excessive level of radicals may contribute in the progression and pathogenesis of the disease due to depletion of antioxidants.(6,7)

In this research we study levels of antioxidants and oxidative stress markers among the COVID-19 patients.

**Material And Methods**

This study was carried out on COVID-19 patients admitted in Shivtej Arogya Seva Sansth’s Govt. covid care centre. Fifty patients with confirmed

COVID-19 according to ICMR guidelines and fifty healthy age and sex matched non covid-19 controls were included in the study often obtaining their informed consent. The study was conducted on with age group between 20 to 60 years. The analysis of biochemical parameters was done using standard grade reagent chemicals. Superoxide Dismutase (SOD) by Marklund and Marklund method, (8) and Vitamin C by Ayekaw method, (9)

The exclusion criteria included subjects of any systemic or metabolic disease, liver disease, vascular diseases, renal artery stenosis, alcoholics, pregnant female and those who were taking any kind of medication last few years. A record was maintained containing current history, diet along with laboratory investigations and previous history of any disease.

**Distribution Of Study Subjects:**

<b>Group I</b>	N = 50 COVID-19 patients.
<b>Group II</b>	N= 50 Healthy controls

**Collection Of Blood Samples:**

Blood was collected from each subject under aseptic conditions by using vacutainers. The blood samples were allowed to clot at room temperature for 20–30 minutes & serum was separated from cells by

centrifugation for analysis of biochemical parameters. The analysis of biochemical parameters was done by using standard grade reagents and chemicals. Serum reagent as per the manual provided by the manufacturer.

**Results**

**Table no. 1: The mean value of Vitamin C and Superoxide Dismutase (SOD) in COVID-19 patients and controls.**

Name Of the Parameters	Covid-19 Patients (N=50)	Controls (N==50)	Significance

	Mean $\pm$ SD	Std. Error of Mean	Mean $\pm$ SD	Std. Error of Mean	
Vitamin C	0.46 $\pm$ 0.41 ***	0.058	0.89 $\pm$ 0.40	0.057	<b>P =&lt; 0.001</b>
Superoxide Dismutase (SOD)	4.80 $\pm$ 0.96 ***	0.13	03.08 $\pm$ 0.51	0.72	<b>P = &lt;0.001</b>

The statistical method uses to compare data was unpaired 't' test

\*P> 0.05.....Not Significant

\*\*P<0.05.....Significant

\*\*\*P<0.001.....Highly Significant

There is highly statistically significant difference in means of Vitamin C and SOD (P < 0.001) as compare to controls.

In the present study Mean of Vitamin c was lower in COVID-19 patients than controls (P < 0.001) and Superoxide Dismutase (SOD) was higher in COVID-19 patients than controls (P < 0.001).

## Discussion

The effect of covid-19 on plasma levels of vitamin C and SOD has been investigated by the current study, we found Vitamin C were significantly lower and serum SOD levels were increased in covid-19 patients compared with healthy controls. These findings are similar with other two studies in which Care C, Chriscano-camon L et al reported extremely low levels of vitamin C in covid-19 patients .(10) one more finding also supports our study that report shows antioxidant vitamins are reduced in SARS-Cov-2 infection due to their scavenging effect on ROS.(11) Fereshteh M, Amir H also found significantly increased levels of SOD in covid-19 patients than control group (12)while the other report shows the levels of erythrocytes GSH,GPx, plasma catalase and plasma SOD were lower in Covid-19 patients compared with controls. (13)

These study observed that lower values of antioxidant vitamins in covid-19 subjects may be due to overproduction of ROS and a deprived antioxidant system.(14) In general, RNA viruses promote changes in the body's antioxidant defence system, affecting enzymes such as superoxide dismutase (SOD) and catalase (CAT), in addition to reducing the levels of antioxidant molecules such as ascorbic acid, carotenoids, and reduced glutathione (GSH).(15,16)Oxidative stress can arise through the increased production of reactive oxygen species (ROS) and because of a deficiency of antioxidant defences and this may further worsen in respiratory diseases (COVID-19 inclusive), especially when the level of free radicals is high. (17)

## Conclusion

In conclusion, this present research evaluated plasma level of antioxidant vitamin and SOD in covid-19 patients compared with control groups. From our findings, we conclude that the lower values of vitamin C in covid-19 patients may be due to overproduction of ROS and a deprived antioxidant system. Furthermore, Covid-19 infection with other comorbidities are at high risk of developing oxidative stress, and hence we suggest that strategies to improving levels of antioxidant vitamins, preventing oxidative stress may help in covid-19 management.

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