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# ROLE OF VITAMIN D3, D-DIMER AND SERUM FERRITIN LEVELS IN ASSESSING THE SEVERITY OF ILLNESS IN COVID - 19 PATIENTS

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**ABSTRACT** **Introduction-**Coronavirus-2019 (COVID-19) caused by severe acute respiratory syndrome-associated coronavirus-2 (SARS-CoV-2) has affected the lives of millions of individuals globally. Vitamin D is thought to reduce the risk of viral infections through several mechanisms, and decreased vitamin D levels have been observed in patients with viral pneumonia. Increased D-dimer levels have been observed in severe Covid-19 cases accompanied by microangiopathy and a hypercoagulable state. The levels of ferritin, a crucial immune response mediator, increase in severe Covid-19 cases. **Aim -** To study the association of Vitamin D3, D-Dimer and Serum Ferritin levels in assessing the severity of disease in patients infected with COVID -19 through a retrospective cum prospective study. **Methodology-** This was a single Centre hospital-based study conducted in 142 patients admitted to the intensive care units and wards at our institute. **Conclusion -** Among the multiple markers used to assess the severity of disease in COVID-19 patients, serum ferritn and d-dimer were found to be better markers to assess the severity of COVID -19 in patients than vitamin-D levels.

**KEYWORDS :** Vitamin D , D-Dimer , S. Ferritin

## INTRODUCTION

- Coronavirus-2019 (COVID-19) caused by severe acute respiratory syndrome-associated coronavirus-2 (SARS-CoV-2) has affected the lives of millions of individuals globally and severely strained the medical community.
- Vitamin D, which affects the nuclear vitamin D receptor, enhances innate cellular immunity by inducing antimicrobial peptides. Vitamin D is thought to reduce the risk of viral infections through several mechanisms, and decreased vitamin D levels have been observed in patients with viral pneumonia.
- D-dimer is a fibrin degradation product used to exclude the diagnosis of thrombosis. Increased D-dimer levels have been observed in severe Covid-19 cases accompanied by microangiopathy and a hypercoagulable state.
- The levels of ferritin, a crucial immune response mediator, increase in severe Covid-19 cases. Increased ferritin levels could cause a cytokine storm by exerting direct immunosuppressive and pro-inflammatory effects.

## AIM

- To study the association of Vitamin D3, D-Dimer and Serum Ferritin levels in assessing the severity of disease in patients infected with COVID -19 through a retrospective cum prospective study.

## MATERIALS AND METHODS

- This was a single Centre hospital-based retrospective cum prospective type of study conducted in 142 patients admitted to the intensive care units and wards at our institute.

### Inclusion Criteria

- All laboratory confirmed cases of COVID 19 with positive RT-PCR
- Age more than 18 years

### Exclusion Criteria

- Patients with comorbidities like malignancy, protein calorie malnutrition, coronary artery disease, deep venous thrombosis of lower/upper limbs and old or fresh cereberal vascular accident cases.

### Statistical Analysis

- Analysis of the collected data was done using appropriate statistical tools.
- Summary of the data was entered in MS-excel and analyzed in SPSS V 22 software. P values were reported for all statistical tests and a value of < 0.05 was considered significant.

## RESULT

Out of 142 patients in the current study, 101 (71.1%) were men and 41 (28.9%) were women. The largest percentage of the participants were in the 46–55 age range, with 41 (28.9%) participants, trailed by 31 (21.8%) patients in the 56–65 age range, and 20 patients older than 66. Patients under the age of 25 made up the smallest percentage of patients (21, or 14.8%), followed by patients between the ages of 26 and 35.

T-test was applied to compare the difference of the mean value Vitamin D among alive and death groups which was found to be statistically non-significant (P>0.05).

The mean value 22.620 of alive group was non-significantly higher than the mean value 17.000 of death group.

**Table 1: Comparison Of Mean Vitamin-d Value**

| Variable | Death | N | Mean | Std. Dev | T Test | P Value | Result |
|---|---|---|---|---|---|---|---|
| Vitamin D | Alive | 134 | 22.620 | 8.165 | 1.933 | 0.055 | Non Sig |
| | YES | 8 | 17.000 | 3.117 | | | |

T-test was applied to compare the difference of the mean value of D-Dimer among alive and death group which was found to be statistically significant (P<0.05).

The mean value 2954.431 of alive group was significantly lower than the mean value 8737.375 of death group.

**Table 2: Comparison Of Mean D-dimer Value**

| Variable | Death | N | Mean | Std. Dev | T Test | P Value | Result |
|---|---|---|---|---|---|---|---|
| D-Dimer | Alive | 134 | 2954.431 | 3920.062 | 3.995 | 0.000 | Sig |
| | YES | 8 | 8737.375 | 4943.903 | | | |

T-test was applied to compare the difference of the mean value of Ferritin among alive and death groups which was found to be statistically significant (P<0.05).

The mean value 427.159 of alive group was significantly lower than the mean value 806.375 of death group.

**Table 3: Comparison Of Mean Ferritin Value**

| Variable | Death | N | Mean | Std. Dev | T Test | P Value | Result |
|---|---|---|---|---|---|---|---|
| FERRITIN | Alive | 134 | 427.159 | 368.956 | -2.815 | 0.006 | Sig |
| | YES | 8 | 806.375 | 392.747 | | | |

## DISCUSSION

Out of 142 patients in the current study, 101 (71.1%) were men and 41 (28.9%) were women. The large percentage of the participants were in the 46–55 age range, with 41 (28.9%) participants, trailed by 31 (21.8%) patients in the 56–65 age range, and 20 patients older than 66. Patients under the age of 25 made up the smallest percentage of patients (21, or 14.8%), followed by patients between the ages of 26 and 35. This demonstrates that the majority of people were male and that their average age was 45 + 10.2 years. Based on a study by Maharudra Shekhanawar et al., the average age was 60 and covid-19 was more common in men than in women.[1]

According to a study by Hasan Ejaz et al., individuals with multiple comorbidities are more likely to get an infection.[2] Critical conditions can develop in those with high blood pressure, diabetes, COPD, heart disease, cancer, or individuals with HIV. Significantly severe symptoms and higher mortality rates are experienced by COPD patients. Another test done on patients to look for thrombosis is the D-dimer level.[3] The early phases of COVID-19 disease are characterized

by an increase in D-dimer and fibrinogen levels, according to studies. D-dimer levels that increase by three to four times are indicative of poor prognosis. In our 142-patient research sample, the mean D-Dimer score was 2954.4 for patients who were discharged and 8737.3 for those who passed away.[4] The mean D-Dimer was compared using the T-test between the surviving and succumbed groups, and it was shown to be statistically meaningful (P< 0.05). D-dimer levels above 2.14 mg/L correctly guessed in-hospital mortality with an accuracy of 88.2 percent and a specificity of 71.3%, according to Yumeng Yao et al. (AUC 0.85; 95% CI = 0.77-0.92).[5]

Particularly in cases of severe hyperferritinemia, which contributes to the cytokine storm, ferritin is a key modulator of immunological dysregulation through its direct immuno-suppressive and pro-inflammatory effects.[6] It has been hypothesized that the severity of the disease is dependent on this state because it has been demonstrated that severe results from COVID-19 are followed by this cytokine storm syndrome. In our study, patients who were discharged had a mean serum ferritin level of 427.15, while patients who died had a mean serum ferritin level of 806.3.[7] The T test was used to compare the mean ferritin values between the groups that were living and those who died, and it was shown (P 0.05) to be statistically significant. Sibtain Ahmed and others reported 157 occurrences in total. The severe group's median ferritin levels were found to be substantially higher than the non-severe group's, at 828.5 and 357.5ng/mL, respectively. AUCs of 0.66 (95% CI: 0.57 to 0.74) and 0.69 (95% CI: 0.58 to 0.79) were obtained., respectively, ferritin was a somewhat stronger predictor of succumbed than severity.[8]

Low vitamin- D level has been demonstrated to be related to a variety of clinical issues, including a greater sensitivity to infectious illnesses.[9] In our research, patients who survived had an average vitamin D level of 17.0, while patients who were discharged had a average level of 22.620. The mean vitamin D levels of patients who survived and were discharged were compared using a t-test, and it was discovered that there was no statistically significant difference (P>0.05). According to Aleksandar Radujkovice and colleagues, patients with vitamin D deficiencies required more (intense) oxygen therapy and IMV and had increased hospitalization rates.[10] In our patients, decrease vitamin D was related with a 6-fold greater risk of a severe duration of the infection and a nearly 15-fold increased chance of mortality after accounting for age, gender, and comorbidities.

## CONCLUSION

- Serum ferritin and D-dimer were found to be better markers to assess the severity of COVID -19 in patients than vitamin-D3 levels.

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