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# To Analyse Inflammatory Biomarkers Like S. Ferritin, ESR, CRP & D-Dimer during COVID-19 Infection in Diabetics

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**Abstract:** ***Aims and Objectives: To analyse the various inflammatory markers of Covid infection in diabetic and non-diabetic patients. Introduction: COVID-19 pandemic caused by SARS-CoV-2 emphasises inflammation's vital role in disease progression. Inflammation significantly impacts COVID-19, affecting the immune system and blood clotting. ESR, CRP, and D-Dimer are key markers revealing inflammation and clotting issues, shedding light on the disease's complexity. ESR often rises, indicating systemic inflammation, particularly in severe cases with cytokine storms causing organ damage. Monitoring ESR helps gauge inflammation's intensity, guiding treatment for severe cases. CRP levels frequently increase, signalling acute inflammation and early disease progression. High CRP levels correlate with disease severity, especially lung complications. It can serve as a prognostic indicator. COVID-19 poses thrombotic risks, with elevated D-dimer levels indicating hypercoagulability and worse outcomes. Monitoring D-dimer helps assess thrombotic risks and guide anticoagulation therapy. These biomarkers are crucial for early detection of inflammation and clotting issues, aiding in identifying high-risk patients and guiding clinical management. Understanding inflammation and clotting dynamics can inform targeted therapies, like anti-inflammatory and anticoagulant treatments, to mitigate disease progression. Longitudinal studies are needed to track these biomarkers' changes during COVID-19 infection. Incorporating ESR, CRP, and D-dimer into clinical practice improves patient care and helps combat the pandemic. This scientific article explores their significance in COVID-19, offering insights into disease severity and potential treatments. Material & Methods: In this single-centred retrospective case-control study, 162 COVID-19 patients admitted to SVBP hospital from March 2020 to June 2021 were evaluated. After exclusions, 81 COVID-positive diabetic patients were selected as cases, and 81 COVID-positive non-diabetic patients served as controls. Demographics, clinical details, laboratory results, and imaging were recorded. Patients were categorised by HbA1c levels. Various investigations, including ESR, CRP, LFT, KFT, HbA1c, and radiological assessments (HRCT severity score and CXR PA Views), were conducted. Statistical analysis utilised the chi-square test (95% confidence interval, p-value < 0.05) to assess associations. Results: In the diabetic group, mean serum ferritin was 918.92 (SD = 424.23), D-dimer was 5.54 (SD = 2.85), CRP was 76.51 (SD = 39.95), and ESR was 42.01 (SD = 9.66). In the non-diabetic group, mean serum ferritin was 822.91 (SD = 424.23), D-dimer was 3.11 (SD = 2.85), CRP was 65.27 (SD = 39.95), and ESR was 22.81 (SD = 9.66). Statistical analysis revealed a non-significant association for serum ferritin (p = 0.244), a significant association for D-dimer (p = 0.001), a non-significant association for CRP (p = 0.082), and a significant association for ESR (p = 0.001).***

**Keywords:** COVID-19, SARS-CoV-2, inflammatory biomarkers, Erythrocyte Sedimentation Rate (ESR), C-Reactive Protein (CRP), D-Dimer, inflammation, coagulation, disease severity.

## 1. Introduction

The COVID-19 pandemic caused by SARS-CoV-2 has highlighted the crucial role of inflammation in disease progression. Inflammation plays a pivotal role in COVID-19 pathogenesis, affecting both immune responses and coagulation pathways. ESR, CRP, and D-Dimer are established markers of inflammation and coagulation, offering insights into the disease's multifaceted nature. COVID-19 patients often present with increased ESR, suggesting heightened systemic inflammation. Elevated ESR may reflect cytokine storm, a prominent feature of severe cases, contributing to organ damage and disease progression. Monitoring ESR can provide information about the intensity of inflammation and guide treatment decisions, especially in severe cases requiring anti-inflammatory interventions.

Elevated CRP levels are commonly observed in COVID-19 patients, indicative of acute-phase inflammation. CRP can surge rapidly, serving as an early marker of disease progression. High CRP levels correlate with disease severity, suggesting its potential as a prognostic indicator. CRP's association with lung involvement highlights its role in monitoring pulmonary complications. COVID-19 is associated with an increased risk of thrombotic complications. Elevated D-dimer levels, a marker of fibrin degradation, reflect hypercoagulability and endothelial dysfunction. Elevated D-dimer levels have been linked to worse outcomes, including higher mortality rates. Monitoring D-dimer can aid in assessing thrombotic risk and guiding anticoagulation therapy. ESR, CRP, and D-dimer can serve as early indicators of inflammation and coagulation dysregulation, allowing for timely intervention and monitoring. Elevated levels of these biomarkers can assist in identifying patients at higher risk of severe disease, enabling focused clinical management. Understanding the interplay between inflammation and coagulation can guide the development of targeted therapies, such as anti-inflammatory agents and anticoagulants, to mitigate disease progression and complications. Longitudinal studies are needed to better comprehend the dynamic changes in ESR, CRP, and D-dimer throughout the course of COVID-19 infection and their correlation with clinical outcomes and post-acute effects.

ESR, CRP, and D-dimer emerge as essential biomarkers in assessing inflammation, coagulation, and disease severity in COVID-19 infection. Incorporating these markers into clinical practice can aid healthcare providers in tailoring interventions, predicting outcomes, and improving patient care, thereby contributing to the ongoing battle against the pandemic.

This scientific article delves into the significance of four key inflammatory biomarkers-Serum ferritin, Erythrocyte Sedimentation Rate (ESR), C-Reactive Protein (CRP), and D-Dimer in COVID-19 infection. By examining their alterations and clinical implications, we aim to provide a comprehensive understanding of how these biomarkers contribute to disease severity, prognosis, and potential therapeutic interventions.

## 2. Material & Methods

This retrospective case & control single-centred study was done with 162 admitted Covid patients in the tertiary covid care SVBP hospital during March 2020 to June 2021 who were admitted, evaluated and managed in this Hospital. After considering the Exclusions, 81 COVID positive Diabetic patients were taken from the admitted patients as the Cases and 81 COVID positive Non Diabetic patients as the Controls. Diabetic patients admitted in this hospital during this Covid phase were selected and taken as cases, their demographic, clinical details, laboratory investigations were recorded, imaging was done and traced. Non Diabetic patients admitted were taken as control for assessment. Patients were divided into four groups based on HbA1c values. Various blood investigations including ESR, CRP, LFT, KFT, HBa1c and radiological investigations HRCT severity score, CXR PA Views were done. This Data was entered in the spreadsheet and appropriate statistical tests i. e. the chi square test (with confidence interval of 95% and p value < 0.05) was applied to assess the associations of this study.

**Inclusion Criteria:**

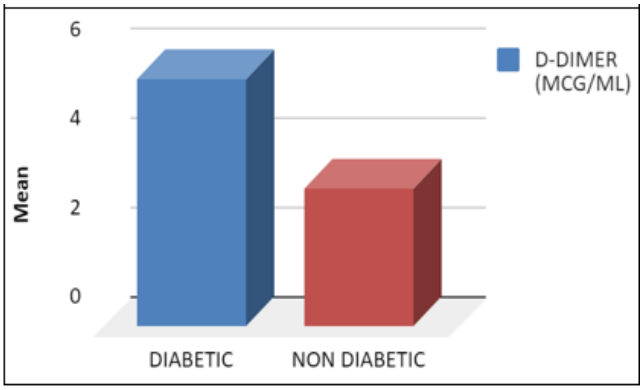
**Case**
- Patients who are known cases of Diabetes Mellitus who had COVID 19 infection
- Age more than > 18yrs

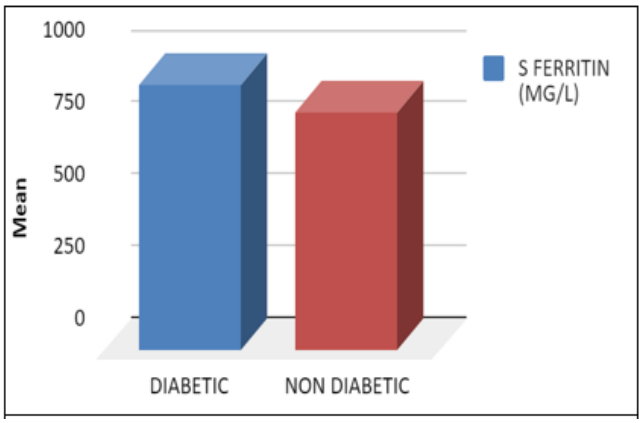
**Control**
- Patients who are not a known case of Diabetes Mellitus and had COVID 19 infection
- Age more than > 18yrs

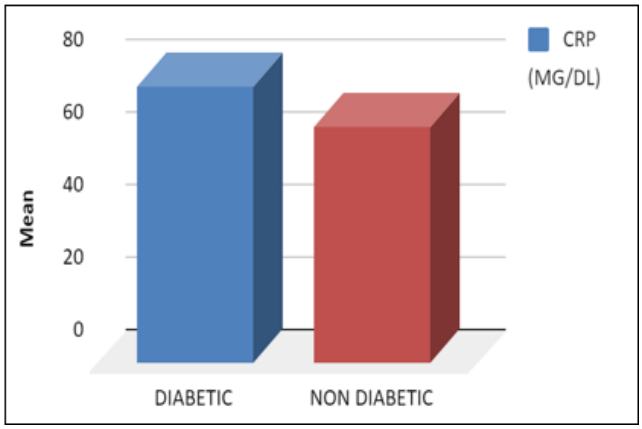
**Exclusion Criteria:**
- NON COVID-19 Patients
- ARDS cause other than COVID-19
- Pregnant female
- Active immunological disease
- Evidence of clinical cardiovascular disease [Cardiac, Cerebral or Peripheral Vascular disease]
- Immunocompromised group
- People with known malignancies
- Age less than <18 yrs & more than > 65 yrs

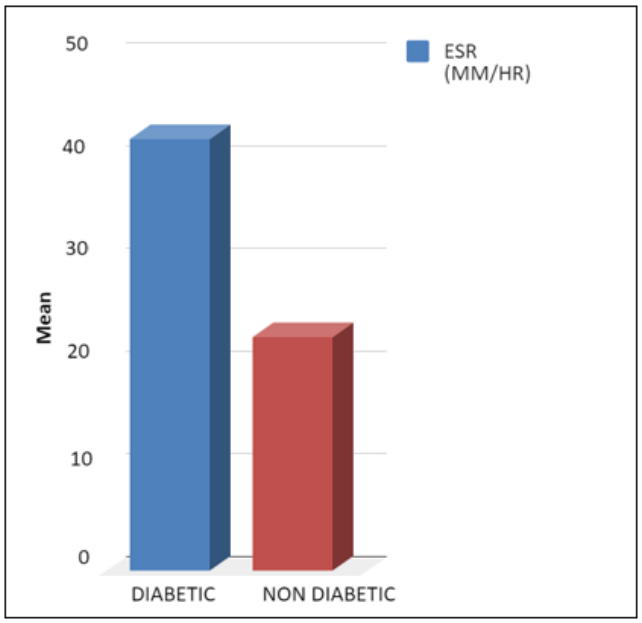
## 3. Observation

| Inflammatory markers | Cases | | Controls | | t value | p value |
|---|---|---|---|---|---|---|
| | Mean | SD-/+ | Mean | SD-/+ | | |
| S. ferritin (mg/dl) | 918.92 | 605.89 | 822.91 | 424.23 | -1.168 | 0.244 |
| D-dimer (mcg/dl) | 5.54 | 3.43 | 3.11 | 2.85 | -4.907 | 0.001 |
| CRP (mg/dl) | 76.51 | 41.71 | 65.27 | 39.95 | -1.751 | 0.082 |
| ESR (mm/hr) | 42.01 | 23.35 | 22.81 | 9.66 | -6.837 | 0.001 |



The given table shows that in the diabetic group the mean value of serum ferritin was 918.92 and standard deviation was 424.23 While in non diabetic patients the mean value of serum ferritin was 822.91 with standard deviation of 424.23. The association came out to be statistically non significant with p value of 0.244 The mean value of D dimer was 5.54 in diabetic patients with standard deviation of 2.85 as compared to mean value of 3.11 and standard deviation of 2.85 among the non diabetic patients. The association came out to be statistically significant with p value of 0.001. On comparing value of CRP, the mean value came out to be 76.51 in diabetic patients with standard deviation of 39.95 while the mean value of CRP in non diabetic patients comes out to be 65.27 with standard deviation of 39.95. The association came out to be statistically non significant with p value of 0.082. In diabetic patients the mean value of ESR was 42.01with standard deviation of 9.66 as compared to mean value of 22.81 with standard deviation of 9.66 in non diabetic patients. The association came out to be statistically significant with p value of 0.001.

## 4. Results

A total of 162 laboratory confirmed COVID-19 patients were enrolled in this study, out of which 81 were diabetic (cases) and 81 were non diabetic (control). In the cases i. e Diabetic Covid group 4 cases (4.9%) of the total 81 cases belonged to the age group of (18-25 years), 41 cases (50.6%) belonged to the age group of (26-50 years) and the remaining 36 cases (44.4%) belonged to the age group of (51-65 years). In the controls i. e Non-Diabetic Covid group, 18 cases (22.2%) of total 81 controls belonged to the age group of (18-25 years), 35 cases (43.2%) belonged to the age group (26-50 years) and 28 cases (34.6%) belonged to the age group (51-65 years). Our study included 31 (38.3%) females and 50 (61.7%) males in the diabetic group. Non-diabetic group comprised 28 (34.6%) females and 53 (65.4%) males.

## 5. Discussion

The given table shows that in diabetic group the mean value of serum ferritin was 918.92 and standard deviation was 424.23 while in non diabetic patients the mean value of serum ferritin was 822.91 with standard deviation of 424.23. The association came out to be statistically non significant with p value of 0.244 The mean value of D dimer was 5.54 in diabetic patients with standard deviation of 2.85 as compared to mean value of 3.11 and standard deviation of 2.85 among the non-diabetic patients. The association came out to be statistically significant with p value of 0.001. On comparing value of CRP, the mean value came out to be 76.51 in diabetic patients with standard deviation of 39.95 while the mean value of CRP in non diabetic patients comes out to be 65.27 with standard deviation of 39.95. The association came out to be statistically non significant with p value of 0.082. In diabetic patients the mean value of ESR was 42.01with standard deviation of 9.66 as compared to mean value of 22.81 with standard deviation of 9.66 in non diabetic patients. The association came out to be statistically significant with p value of 0.001

## 6. Conclusion

This analysis revealed that serum ferritin levels did not significantly differ between diabetic and non-diabetic groups. However, D-dimer levels were significantly higher in diabetic patients, suggesting a potential clinical relevance. C-reactive protein levels did not show a significant difference, and the erythrocyte sedimentation rate was significantly elevated in diabetic patients. These findings imply the importance of considering D-dimer and ESR as potential biomarkers for diabetes. Further research is essential to explore their clinical implications and mechanisms, while also acknowledging the nuances of non-significant associations.

**Conflicts of Interest:** There is no conflict of interest to disclose.

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