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A Comparative Study of Serum Ferritin Between type 2 Diabetes Mellitus & Non-Diabetes Mellitus Symptomatic patient with COVID-19 and Correlation of Blood Glucose and Serum Ferritin in Type 2 Diabetes Mellitus with COVID-19

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Abstract

Background: COVID-19 is caused by SARA-CoV-2. Present studies explain the alteration in biochemical parameters, that become useful to clinical condition of COVID-19 patient. The total of 100 COVID-19 patients were included in the final analysis at Pacific Institute of Medical Sciences (PIMS), Udaipur, Rajasthan, India.

Methods: The present research focuses on analyzing the importance of biochemical biomarkers Diabetic and non-diabetic with COVID-19 patients including Blood Glucose Fasting and serum Ferritin in COVID-19 patients and their implications in the evolution of the disease by using standard procedure of selected biochemical parameters.

Results: The present study showed that Blood Glucose Fasting and serum Ferritin level was significantly high in diabetic with COVID-19 patients compare to non-diabetic COVID-19 patients.

Conclusions: Our study also shows that diabetic mellitus with COVID-19 patient have a high risk of critical condition and developing sever disease and show poor prognosis compared to non-diabetic COVID-19 patent.

Keywords: COVID-19, Ferritin, Blood Glucose Fasting

Introduction

The COVID-19 outbreak has led to an unprecedented global health crisis, by testing health systems preparedness and ability to cope with a pandemic response [1–2]. The first SARS-CoV-2 case of this virus was officially reported in December 2019 in Wuhan, China, and rapidly spread in the entire country and beyond within 30 days [3-4].

Now Corona virus cases have been reported in more than 210 countries across the world and Over 12.94 million people have been infected by novel Corona virus in the whole world. The ongoing pandemic has claimed over a million lives globally and continues to infect many more every day. In India the mortality rate is 3.09 % and cases are seen in states which are declared as red zone. Maharashtra has reported a mortality rate of 3.57% [5].

COVID-19 patients with Diabetes Mellitus are more prone for morbidity as compared with non-diabetic COVID-19 patients. Diabetes Mellitus in COVID-19 patients increases the susceptibility of complications with concomitant decrease immune system [5].

Diabetes mellitus (DM) is challenging in the context of COVID-19 pandemic. The prevalence of diabetes in patients with COVID-19 (Corona virus Disease 2019), caused by severe acute respiratory syndrome corona virus 2 (SARS-CoV-2) infection, has varied

across many countries, ranging from 5–20% in China, 17% in Lombardy in Italy and 33% in the USA [1-4]

DM can interfere with host–viral interactions and host–immune responses through several mechanisms that could also lead to poor outcomes. Individuals with DM, hypertension, and severe obesity (BMI ≥ 40 kg/m2) appear to be more likely to be at a higher risk for complications and death from COVID-19. In some studies, the prevalence of diabetes patients hospitalized in intensive care units (ICUs) for COVID-19 was two- to threefold higher, and the mortality rate is at least double, than that of non-diabetes patients. As the population with diabetes is highly heterogeneous, it is of major interest to determine the effect of Type 2 diabetes mellitus (T2DM) on the progression to a more severe SARS-CoV-2 infection [5-6]

Methods

A study was conducted in Pacific Institute of Medical Sciences, Rajasthan, from March to December on COVID-19 patients. The source population was all cases of COVID-19 admitted at PIMS with a confirmed diagnosis of COVID-19 using RT-PCR, as reported by central laboratory. In Inclusion Criteria Sample above 20-85 year of age, patient having RT-PCR positive report, patients RT-PCR report negative but high-resolution computed tomography (HRCT) showing positive included.

Ex –smokers, Previous and family history of coronary heart disease, Patient taking a steroid drug was in exclusion criteria.

About 2 ml blood for HBAIc was drawn in EDTA vial (Ethylene diamin tetraacitic acid) using sterile vacutainer. About 2 ml blood was drawn using perfectly dry and sterile vacutainer. The serum was separated with the help of centrifuge machine within 1 hours of collection to prevent changes in Ferritin. A total number of 100 patients admitted at Pacific Institute of Medical Sciences Udaipur with COVID-19, was form the subjects of the present study. Out of these 50 patients were suffering from DM-2 (COVID-19 symptomatic), and 50 were without the DM-2 (COVID -19 symptomatic). Efforts will be made to match all anthropometric factors comparable to both the groups of patients.

Clinical Methodology

Symptoms (fever, cough, dyspnea, headache, nasal congestion, rhinorrhea), serum ferritin and Haematological parameters levels) were recorded by using Autoanalyzer.

Statistical Analysis

For the quantitative analysis, we used the software SPSS software. In this meta-analysis, all p values reported were two-tailed with the statistical significance set at ⩽ 0.05.

Result

The present study showed that level of serum ferritin was high in DM CVOID-19 patients compare to NDM COIVD positive patients (Table.1, Fig.1). And also show insignificant correlation of blood glucose and ferritin (Table.2, Fig.2).

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Table 1: comparison of ferritin between non-diabetic COVID positive and diabetic COVID positive patient

S. No	Test	COVID Positive Without Dm		COVID Positive with Dm		P Value
		MEAN	SD	MEAN	SD	
1	Blood Glucose Fasting	101.1	12.45	171.64	32.0	P < 0.0001

Volume 6, Issue 4; July-August 2023; Page No 202-206

2	Serum Ferritin	450.8	387.37	711.18	496.75	P = 0.0001

Figure 1: comparison of ferritin between non-diabetic COVID positive and diabetic COVID positive patient

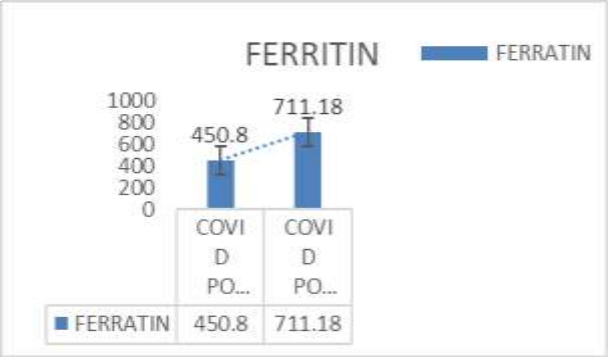
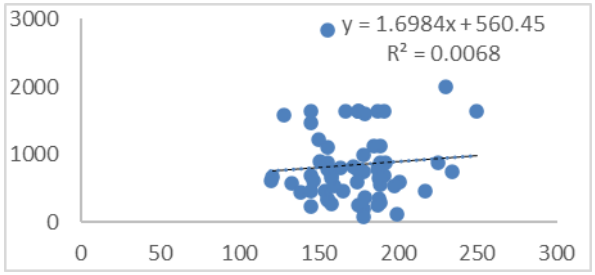


Table 2: Correlation of blood glucose to ferritin

S. No	Correlation of		Correlation to	correlation coefficient	R^2	P value
1	Blood Glucose		Serum Ferritin	0.821	0.0006	P=0.082

Figure 2: Correlation of blood glucose to ferritin



Discussion

Present study shows that the mean and standard deviation of Ferritin in non-diabetic group (450.8± 387.37) and in Diabetic group (711.18± 496.75) was significantly different and the p value was significant (P=0.0001). in this study the value of Ferritin is higher in diabetic COVID positive patient compared to non-diabetic COVID positive Patient. It is an important mediator of dysregulation of immune system mainly under extreme hyperferritinemia through direct immune suppressive and pro-inflammatory impacts, giving rise to cytokine storm.

Acute viral infection like COVID-19 is characterized by improper iron metabolism, ending up in increase serum ferritin and decrease Iron. Mechanism is inflammatory response mediates this increase ferritin levels. It is an important acute phase protein, and its expression is increased by pro inflammatory cytokines during the infection.

Volume 6, Issue 4; July-August 2023; Page No 202-206

Secondly there may be hepcidin mediated disorder leading to increase acute phase protein.

Also, SARS Cov 2 increase disruption of Hb 1 B chain and dissociation of porphyrin from iron, which then finally increase expression of ferritin 7.

In a study by Maryan A. Hussain at all, they showed correlation coefficient between ferritin and COVID-19 in the blood with significant increased association because ferritin is a protein to store Iron, so the increased concentration promotes cytokine storm along with extreme severity 8.

Ferritin is the key mediator of dysregulation of immune system, mainly under excessive hyperferritenemia, by pro-inflammatory effects and direct Immuno-suppressive mechanism which increases cytokine storm. 9

There is no correlation show of Blood Glucose with Ferritin. Vaibhav Rai Saurav et al also show that there is no correlation of Diabetes with inflamtory marker and coagulation marker 10.

Conclusion

The present study done on Diabetes mellitus and non-diabetes mellitus with COVID-19 symptomatic patient admitted in Pacific Institute of Medical Sciences, Umarda, Udaipur. Total 100 patients were including for this study. The 50 patients were diabetes with COVID-19 and 50 was non diabetes with corvid 19. 20-80 age group was taken for this study the study shows that the mean value and standard deviation of ferritin and blood sugar were significantly high in diabetic COVID-19 patients compare to non-diabetic COVID-19 patients but there is no correlation shows between diabetic mellitus and ferritin.

Our study also shows that diabetic mellitus with COVID-19 patient have a high risk of critical condition and developing sever disease and show poor prognosis compared to non-diabetic COVID-19 patent.

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Ethical approval: Research project approved by the ethics committee of Pacific Institute of Medical Sciences, Umarda Udaipur- 313005, Rajasthan, India.

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Volume 6, Issue 4; July-August 2023; Page No 202-206

Volume 6, Issue 4; July-August 2023; Page No 202-206