Analysis of Hematological Parameters Between Type 2 Diabetes Mellitus & Non-Diabetes Mellitus Symptomatic Patient With Covid-19

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Abstract
Background: COVID-19 is caused by SARACoV-2. Present studies explain the alteration in biochemical parameters, that become useful to clinical condition of COVID-19 patient. The total of 200 COVID-19 patients were included in the final analysis at PIMS, Udaipur, Rajasthan.
Methods: This paper focuses on analyzing the importance of Hematological Parameters in diabetic and non-diabetic with covid-19 patients including HB, WBC, PLT 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 hemoglobin and Platelet count was significantly low in diabetic with COVID -19 patients compare to nondiabetic covid-19 patients. And the level of WBC was 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, WBC, Hb, Platelet count

Introduction

In December 2019, hospitals in Wuhan City, observe more cases of unexplained pneumonia with a history of exposure to the Seafood Market [1, 2.] On February 11, 2020, the World Health Organization named the disease: coronavirus disease 2019 (COVID-19) [3]. COVID-19, which is caused by a beta-coronavirus, spread widely, and the number of confirmed cases increased day by day. The morphology, genomic structure of this type of coronavirus pneumonia are significantly change from the characteristics of previous coronavirus diseases, such as SARS and MERS [4]. In starting COVID-19 manifests as viral pneumonia after infection, and large number of the population is susceptible to it. Clinical features of COVID-19 patients often include fever, dry cough, sputum, runny nose [5], fatigue, or poor breathing [6]. Lung computed tomography (CT) imaging typically shows ground-glass changes affecting both lungs [7].

COVID-19 has spread with influenza related mortality, and comorbidity with diabetes mellitus type 2 may represent an important risk factor for adverse outcomes [8, 9]. One study showed that between critically ill adult patients, 21 (40%) patients had chronic diseases, with diabetes mellitus type 2 accounting for 17%. Another study showed that glucose metabolism was the basis of the influenza viral infection, leading to a fatal inflammatory reaction [10]. Another study showed that the infection rate of diabetic patients was higher compare to

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nondiabetic patients [11]. Therefore, COVID-19 patients with diabetes comorbidity may have unique disease manifestations [12–14] and laboratory result, as well as different prognoses, compared with patients without comorbidities [15].

Identifying and distinguishing diabetic COVID-19 patients may help to avoid misdiagnosis and improper treatment and may improve prognostic evaluation by clinicians [16]. In this pilot study, based on the retrospective clinical data, we focused on the haematological parameters of patients infected with COVID-19 with and without type 2 diabetes (T2D). Our goal was to determine whether comorbidity with T2D had unique influences on COVID-19 patients.

Methods

A study was conducted in Pacific Institute of Medical Sciences, Sai Tirupati University, Udaipur, Rajasthan, from March to December 2021 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 Complete Blood count was drawn in EDTA vial using sterile vacutainer. A total number of 200 patients admitted at Pacific Institute of Medical Sciences Udaipur with covid 19, was form the subjects of the present study. Out of these 100 patients were suffering from DM-2 (COVID -19 symptomatic), and 100 were without the DM-2 (COVID -19 symptomatic). Efforts will be made to match all anthropometric factors comparable to both the groups of patients.

Test was Done by Fully Automated CBC analyser (Sysmex XN-550). Before measurement of the test Calibration and Quality Control process was done.

Clinical Methodology

Symptoms (fever, cough, dyspnea, headache, nasal congestion etc), 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 mean and standard deviation of haemoglobin in non-diabetic group (12.27 ± 2.11) and in Diabetic group (11.69 ± 2.36) was significantly different and the p value was significant ($p<0.0726$). The result was presented in table no 1 and a box plot was presented in figure no. 1.

Table no. 1 Comparison 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	HGB	12.27	2.11	11.6974	2.369	P<0.0726
2	PLT	228550	82852.48	175080	94363.65	P<0.0001
3	WBC	11064.29	18411.55	21955	48129.37	P<0.0358

The mean and standard deviation of Platelet count in nondiabetic group (228550±82852.48) and in Diabetic group (175080 ± 94363.65) was significantly different and the p value was significant (p<0.0001). The result was presented in table no 1 and a box plot was presented in figure no.2

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The mean and standard deviation of WBC in non-diabetic group (11064.29 ± 18411.55) and in Diabetic group (21955 ± 48129.37) was significantly different and the p value was significant (p<0.0358). The result was presented in table no 1 and a box plot was presented in figure no 3.

Fig 1. Comparison of Haemoglobin in diabetes mellitus and non-diabetes mellitus with covid 19 symptomatic patient
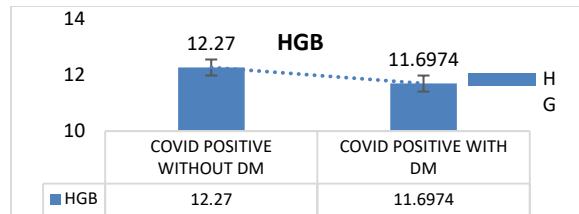

Fig 2. Comparison of Platelet count in diabetes mellitus and non-diabetes mellitus with covid 19 symptomatic patient
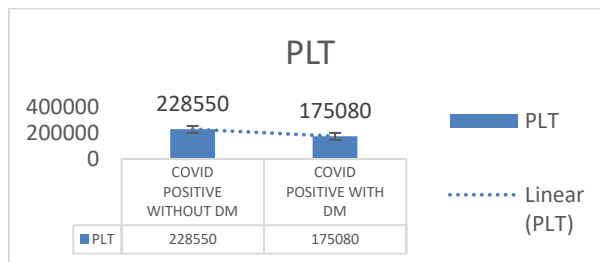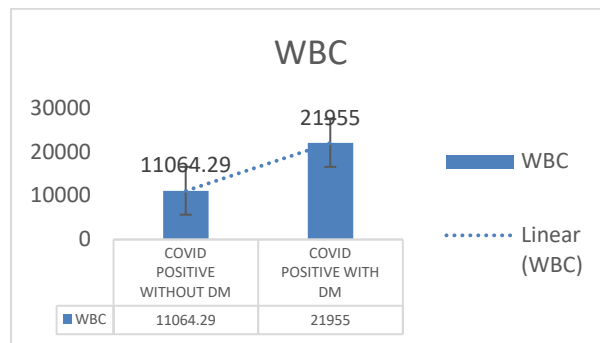

Fig 3 Comparison of WBC in diabetes mellitus and non-diabetes mellitus with covid 19 symptomatic patient

Discussion

In the present study of haematological parameters in non-diabetes group with covid positive, the mean value of haemoglobin was (12.27±2.11) and in diabetic group with covid positive was (11.69±2.36) with p value (<0.0726) that is statically insignificant, in this case haemoglobin was low in diabetic covid positive patient compared to non-diabetic covid positive patient.

Other study that was conduct by Farag Alaa et al show the mean of haemoglobin in non-diabetic patient with covid positive (11.6±1.4) and in diabetic group 11.9±1.4 with p value (0.234) that is insignificant and that is show that the level of haemoglobin in diabetic covid positive patient was low compared to non-diabetic covid positive patient [17]. This is agreement with my study.

Other study that was conduct by Rai Saurav et al show the mean of haemoglobin in non-diabetic patient with covid positive (12.09±2.15) and in

diabetic group (11.9±1.98) with p value (0.68) that is insignificant and that is show that the level of haemoglobin in diabetic covid positive patient was low compared to non-diabetic covid positive patient [18]. This is agreement with my study.

Low haemoglobin concentration in patient diabetic covid positive because diabetes often leads to kidney damage and that can cause anaemia. healthy kidneys release a hormone called erythropoietin which responsible erythropoiesis.in damage kidneys they don't release erythropoietin .so the inhibition of erythropoiesis resulting low red blood cells which finally cause low concentration of haemoglobin [19].

In the present study of haematological parameters in non-diabetes group with covid positive, the mean value of Platelet was (228550±82852.48) and in diabetic group with covid positive was (175080±94363.65) with p value (<0.0001) that is statically significant, in this case Platelet was low in diabetic covid positive patient compared to non-diabetic covid positive patient.

Other study that was conduct by Ozder Aclan et al show the mean of Platelet in non-diabetic patient with covid positive (26727 ± 6464) and in diabetic group (25722 ± 7113) with p value (0.32) that is significant and that is show that the level of Platelet in diabetic covid positive patient was low compared to non-diabetic covid positive patient [20]. This is agreement with my study.

Other study that was conduct by Salem Raneem et al that is show that the level of Platelet in diabetic covid positive patient was significantly low compared to non-diabetic covid positive patient [21]. This is agreement with my study.

Other study that was conduct by Zhou Wan et al show the mean of Platelet in non-diabetic patient with covid positive (16350) and in diabetic group (143000) with p value (0.745) that is insignificant and that is show that the level of Platelet in diabetic covid positive patient was low compared to non-diabetic covid positive patient [22].

In other study, show that was conduct by Boccatondav et al [23] how platelet count values differed between the two groups (COVID-19 and non-COVID-19 patients), with lower values in COVID-19 patients. The hypothetical mechanisms by which SARS-CoV-2 causes thrombocytopenia are the following: impaired haematopoiesis caused by systemic inflammation or cytokine storm, such as IL-6 which is frequently elevated in SARS-CoV-2 infection [24]; SARS-CoV-2 might directly infect haematopoietic stem cells or megakaryocytes through angiotensin-converting enzyme 2, CD13 or CD66a [23], antiviral antibodies could cross-react with haematopoietic cells and/or platelets, as observed for anti-adenovirus antibodies which can cross-react with platelet integrin GPIIb/IIIa [24,25]; impaired maturation of megakaryocytes in COVID-19 patients [24]; thrombotic microangiopathy and disseminated intravascular coagulation leading to the increased consumption of platelets revealed by autopsy of non-survivors [25,26]; activated platelets scavenging by splenic/hepatic macrophages [27]. Some of the mechanisms implicated in COVID-19 pathogenesis, including hypoxia, inflammation, immune system activation and endothelial activation and dysfunction, are known to stimulate of 8 platelet activation and apoptosis, leading to increased thrombosis [28]. Furthermore, the presence of apoptotic platelets promotes hyper activation of surviving platelet.

In the present study of haematological parameters in non-diabetes group with covid positive, the mean value of WBC was (11064.29±18411.35) and in diabetic group with covid positive was (21955±48129.37) with p value (<0.0358) that is statically significant, in this case WBC was high in diabetic covid positive patient compared to non-diabetic covid positive patient.

Because COVID-19 is state of acute inflammation & neutrophils are the cells of acute inflammation, they rise because they help in fighting out the virus whereas lymphocytes count decreases (Henry B.M Aggarwal et al [29], Huang et al [30]. Low WBC count particularly of lymphocytes is associated with more severe illness & death in covid as B cells (lymphocytes) keep a check on COIVD virus by creating antibody. while T lymphocytes destroy the virus infected host cell [31]. Earlier studies say that dysregulation of cellular immune response mainly of T lymphocytes are mainly responsible for pathological process of COVID-19 [32]. However, the total count of lymphocytes /lymphopenia demonstrate no significant difference, the sustained decreased in total T cells and TH &TC subsets &NK subsets were all more remarkable in T2D group. Patient with T2D

also exhibit decreased Tc cell proportion & NK cell count.

Studies have reported that there is a skewed pro inflammatory T cell compartment specially Th subsets in peripheral blood of T2D patients [33]. The cells play a double –edged role in mechanism of antiviral response & sever inflammation. There is also decrease in function of NK cell in T2D; both cytotoxix lymphocytes including Tc & NK were disrupted in T2D. Because there is an extensive interaction of virus with Tc & NK. they play a very important role in clearance of virus infected cells. Nk cells are key immune regulator & decreased in their level is responsible for uncontrolled expansion & activation of other immune effectors [34]. Thus the dysregulated levels & discrepant response of lymphocytes sub population in T2D play a key role in severity & poor prognosis of the infection. The cells regulate antigen presentation & immunity against SARS COV-2 via INF-gamma formation. SARS-COV2 elevates apoptosis of lymphocytes (CD3, CD4&CD8 Tells) & infects the circulating immune cells resulting in lymphocytopenia.

Decreased T cell eradicates the inhibition of innate immune system which result in excess product of inflammatory cytokines called cytokine storm. When there is a late activation of Th1 cell mediated immunity there is a late hyper-inflammatory response [35]. The patient with covid 19, the no of CD4+ &CD8+ cells are decreased & a high proportion of pro-inflammatory Th17, CD4+ cells & increased cytokines is present. Thus it is speculated that patient have weak anti-viral interferon response & late activation of TH1/TH17 create inflammatory response [36].

According to Faria et al, the neutrophils to lymphocytes ratio (NLR) holds a key in predicting inflammation condition of the patient [37]. Lymphocytes count was less in diabetic patients. There may be decreased immune response in diabetic sometimes & increased inflammation marker and severe diabetes designate exacerbation of the chronic inflammation, a unique pathology of DM resulting in cytokine storm& ultimately excess deterioration of endothelial function [38].

Conclusion

The present study done on Diabetes mellitus and non-diabetes Mellitus with corvid 19 symptomatic patient admitted in Pacific Institute of Medical Sciences, Udaipur. Total 200 patients were including for this study .100 was Diabetes with covid 19 and 100 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 Hemoglobin and Platelet Count were significantly low in diabetic covid 19 patient compare to non-diabetic covid 19 patient. But in the case of WBC mean and standard deviation of this parameter was significantly high in diabetic covid positive patient compared to non-diabetic COVID positive.

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 patents.

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