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Alteration of Certain Biochemical and Hematological Parameters in Covid -19 Patients

Praveen Kumar Tagore[1], Vikas K Gupta[2], Sameer Srivastava[3], *Kamal Kachhawa[4], Rajendra Chauhan[5], M Prasanna Chandra[6]

[1]Assistant Professor, Department of Medicine, Government Medical College, Datia, MP, India
[2]Associate Professor, Department of Biochemistry, MaharisiVashishtha Autonomous State Medical College, Basti, UP, India
[3]Associate Professor, Department of Physiology, MaharisiVashishtha Autonomous State Medical College, Basti, UP, India
[4]Assistant Professor, Department of Biochemistry, Government Medical College, Datia, MP, India
[5]Assistant Professor, School of studies in pharmaceutical sciences, Jiwaji University, Gwalior, MP, India
[6]Professor, Department of Medicine, Government Medical College, Datia, MP, India

Abstract

Background: Covid 19 is a newly emergent contagious infectious disease caused by severe acute respiratory syndrome (SARS) – Cov-2 virus that was not found previously in human which belongs to a large family of corona virus. The severity of the disease is altered by alteration of biochemical parameters. This study aims to evaluate somehematological and biochemical parameters in Covid 19 patients admitted at dedicated Covid 19 hospital. To determines hematological and biochemical parameters in Covid 19 patients.

Material and Methods: Present study comprised of 70 Covid 19 patients who admitted at dedicated Covid 19 ward during second wave. They include 22 female and 48 male subjects aged between 15 – 75 years. The data was entered in MS EXCEL spreadsheet and analysis was done using Statistical Package for Social Sciences (SPSS) version 25.0.

Results: The total 70 number of patients admitted due to COVID-19. Their mean age was 38.5±15.7 years. Where the youngest was 17 and the oldest was 71 years old. The parameters with the most altered values were found to be CRP (16.3±12.7) median 11.1 mg/dl and range lowest 1.45 to highest value 55.7 mg/dl, D-dimer, (5.5±4.2) median 5.88 and range from 0.10-21.8 µg/ml and ferritin (166.8±139.6) median 154.6 and range 23.6 to 723.6.

Conclusion: To understand the severity of illness we have to know the effect of Covid-19 on hematological and biochemical profile of patients. This study identified the alteration in biochemical and hematological parameters in Covid-19 at patient's hospital admission as abnormality of biochemical profile increases the severity of illness.

Keywords: Covid-19, C-reactive protein, biochemical parameters.

Corresponding Author:*Dr Kamal Kachhawa, Assistant Professor, Department of Biochemistry, Government Medical College, Datia, MP, India. Email: drkamalkachhawa@gmail.com

Introduction

Covid 19 is a newly emergent contagious infectious disease caused by Severe acute respiratory syndrome (SARS) – Cov-2 virus that was not found previously in human which belongs to a large family of corona virus.[1] It was first recognized in Wuhan, China, December 2019 due to its wide spread outbreak globally and illness severity ranging from common cold to death.[2] WHO declared as a global pandemic on 11thMarch 2020.[3]India

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has been greatly impacted by this pandemic, around 4.29 corer people were infected among them 5.49 lakh death cases were reported.[4] The first covid 19 case was reported in India in a 20 year old female presented to the Emergency Department in General Hospital, Thrissur, Kerala.[5] About 14% infected patients were hospitalization and 5% needed admission to an intensive care unit. Patients with mild to moderate illness are recovered whereas patients with chronic illnesses such as cancer, diabetes mellitus, heart disease and elderly age are more likely to prone to severity.[6] Development of prolonged serious complications may eventually lead to death.[7]

The severity of the disease is altered by alteration of biochemical parameters. The severity of illness is classified in to early infection phase, pulmonary phase and hyper inflammation phase.[8]

Identification of biochemical parameters along with demographic data and clinical data of Covid 19 patients can help the clinician to know the severity of illness, to facilitate appropriate therapeutic strategy in control mortality and to expand scientific knowledge.[9]

According to previous literature the severity of disease is depend on altered biochemical and hematological parameters including lymphocyte count, neutrophil count, platelets count and D-dimer, serum ferritin status.[10-12] A retrospective study on Covid 19 reported changes in inflammatory markers in including C-reactive protein (CRP) and Serum ferritin. Further, laboratory findings of Aspartate transaminase and Alanine transaminase reported to be significantly higher in Covid 19 patients.[7,12] This study aim to evaluate some hematological and biochemical parameters in covid 19 patients admitted at dedicated covid 19 hospital.

Material and Methods

The present study was carried out at dedicated covid 19- hospital Datia, India. A total 70 Covid 19 patients who admitted at dedicated Covid 19 ward during second wave. Their data were collected for this study. They include 22 female and 48 male subjects aged between 15 – 75 years. All the records of patients with laboratory-confirmed RTPCR for COVID-19 disease irrespective of diseases severity and co morbidity were extracted. Data include Biochemical profile Urea, Creatinine, SGOT, SGPT, D-dimer, CRP, ferritin and Hematological Parameters Hemoglobin, TLC, Platelets.

Statistical analysis:

Categorical variables are presented in number and percentage (%) and continuous variables are presented as mean ± SD and median. The data was entered in MS EXCEL spreadsheet and analysis was done using Statistical Package for Social Sciences (SPSS) version 25.0.

Results

The total 70 number of patients admitted due to COVID-19. Their mean age was 38.5±15.7 years, where the youngest was 17 and the oldest was 71 years old. The hematological and biochemical parameters of patients who were admitted were analyzed. The mean and standard deviation of the analyzed biochemical and hematological parameters are shown in [Table 1]. The parameters with the most altered values were found to be CRP (16.3±12.7) median 11.1 mg/dl and range lowest 1.45 to highest value 55.7 mg/dl, D-dimer, (5.5±4.2) median 5.88 and range from 10-21.8 µg/ml and ferritin (166.8±139.6) median 154.6 and range 23.6 to 723.6.

In addition,the biochemical and hematological parameters of COVID-19 patients were also analyzed according to age group (15-30, 30-45, 45-60, 60-75) are shown in [Table 2 & 3]. Majority of alteration in biochemical parameters was reported in elderly age group 60-75 followed by 45-60. The mean value of ferritin, D-dimer and CRP found high in elderly people as compare to younger age group. All the parameters were also analyzed in male

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(68.8%) and female (31.2%) separately are shown in [Table 4 & 5]. Student t test was performed between male and female group but no significant result was found. Pearson correlation has been performed to see the association among considered variable at α=0.05 shown in [Table 6].

Table 1: Showing the clinical characteristics of covid 19 patients.

Parameters	mean± SD	Median(range)
Age(years)	38.5±15.7	35 (17-71)
Urea (mg/dl)	22.5±11.7	19.5 (9.8-58)
Creatinine (mg/dl)	1.0±1.3	.80 (.40-9.3)
SGOT (IU/L)	28.5±13.6	24.1 (4-85.4)
SGPT (IU/L)	32.4±20.4	25.0 (5.8-98.8)
D dimer (µg/ml)	5.5±4.2	5.88 (.10-21.8)
CRP(mg/dl)	16.3±12.7	11.1 (1.45-55.7)
Ferritin (µg/l)	166.8±139.6	154.6 (23.6-723.6)
Hb (gm%)	12.9±1.5	13.1(9-15.7)
TLC (cells/mm^3)	8448.5±6066	7550(3800-51000)
Platelets (/mm^3)	146431±61659	152500 (12400-290000)

Table 2: Showing comparison of biochemical profile in different age group.

Age (n) mean ±SD	Urea (mg/dl)	Creatinine (mg/dl)	SGOT (IU/L)	SGPT (IU/L)	D dimer (µg/ml)	CRP (mg/dl)	Ferritin (µg/l)
15-30 (25)	19.4±2.3	0.86±.17	28.4±2.9	29.3±3.5	5.8±.80	14.7±2.3	117.6±23.5
30-45 (24)	25.3±2.0	1.1±.35	28.7±3.1	36.6±5.2	5.1±.72	13.5±1.5	160.6±24.1
45-60 (10)	26.5±4.5	.76±.06	30.2±2.8	35.7±6.3	3.6±.1.3	17.7±5.6	206.1±45.5
60-75 (11)	19.9±3.7	1.4±.48	26.7±3.2	27.8±3.7	7.8±1.7	23.64.9	256.6±55.4

Table 3: Showing comparison of hematological profile in different age group

Age (n) mean ±SD	Hb (gm%)	TLC (cells/mm^3)	Platelets (/mm^3)
15-30 (25)	13.2±.31	10140±1796	146322±13465
30-45 (24)	12.6±.34	6883±416	158691±11618
45-60 (10)	13.1±.32	7510±1099	137640±17403
60-75 (11)	12.6±.49	8872±1529	127900±19909

Table 4: Showing comparison of biochemical profile between male and female

Gender (n)	Age mean ±SD	Urea (mg/dl)	Creatinine (mg/dl)	SGOT (IU/L)	SGPT (IU/L)	D dimer (µg/ml)	CRP (mg/dl)	Ferritin (µg/l)
Male (48)	40.42 +16.63	20.9±1.5	1.0±.21	29.4±2.1	32.8±3.0	5.2±.65	16.65±1.8	173.6±22.6
Female (22)	34.45+ 13.3	26.0±2.8	1.0±.19	26.4±2.3	31.6±4.2	6.3±.76	14.9±2.66	151.9±.96

Table 5: Showing comparison of hematological profile between male and female

Gender	Hb (gm%)	TLC (cells/mm^3)	Platelets(/mm^3)
Male (48)	13.3±.18	8895±1020	145825±8121
Female (22)	12.0±.38	7472±587	147754±15671

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Table 6: Showing correlation of CRP with D-dimer and ferritin

Correlation	Correlation coefficient	Significant value
CRP vs Platelets	-0.64	0.00*
CRP vs D dimer	-012	0.32
CRP vs Ferritin	0.10	0.38
Age vs CRP	0.21	0.79
Age vs D dimer	0.04	0.74
Age vs Ferritin	0.32	0.00*

*correlation significant at 0.05 level

Discussion

Covid -19 has become a global public health crisis, is entering in to the third year still spreading worldwide. It has affected more than 200 countries globally. Studied stated that 10% of Covid 19 infected cases are asymptomatic and in symptomatic, around 70-80% of cases manifested mild to moderate symptoms are recovered without specialist treatment where as 14% are severe and 5 % are in critical condition required special care.[13] Rapid spread of Covid 19 cases globally effects on human causing severity in illness. There are several studies reported hematological and biochemical abnormalities affect prognosis of disease.[2] To understand the severity of illness we have to know the effect of Covid-19 on hematological and biochemical profile. Therefore, we have evaluated the data of 70 patients admitted in tertiary dedicated covid 19 centre. This study identified the alteration in biochemical and hematological parameters in Covid-19 patient's hospital admission. Adil R Sarhan et al stated that to understand the severity of disease age, co-morbidities, and abnormalities of various clinical biomarkers can be essential.[6]

In this study we have compared hematological parameters like Hemoglobin, Total leukocyte count and platelets. Comparison of these parameters in all patients covid 19 patients [Table 1] showed that hemoglobin levels are slightly decreased than normal range which is also reported by Chen et al.[14] Total leukocyte count is within the normal range and platelets count decreased slightly. Mild thrombocytopenia has been reported by Fan et al.[15] When differentiated according to age group as the age increase platelets count lower as compare to adult age group.[16] D dimer is the degradation product of protein fibrin released in to bloodstream when the blood clot is dissolved. It has two D fragments of the fibrin, is formed by the activation of the plasmin enzyme connected by disulfide bond. Its represents the activation of fibrinolysis and coagulation systems.[17] This study showed elevated level of D dimer in covid 19 patients similar to the study of Huang et al,[18] and qianet al.[11]

C- reactive protein (CRP) produced by liver is a prominent acute phase protein which act as a sensitive bio marker during inflammation, infection and tissue damage.[19] Several studies have stated high concentration CRP in covid 19 patients. In our study we have found elevated levels of C-reactive protein as compare to normal range and the same is supported by Chan et al,[14] and Qin et al.[20] The normal range of C reactive protein is less than 10 mg/L, from the disease onset within 6 to 8 hours its concentration increases rapidly and reaches to highest peak in 48 hours. Its half- life is about 19 hours and its concentration decreases when the inflammatory stages end and the patient is healing. After recovery CRP concentration comes to normal, makes its as a useful bio marker for monitoring severity of disease.[21]Serum Ferritin is also an acute phase, intracellular protein contains 24 subunits surrounding by iron core with 4000–4500 Fe (iron) atoms. Ferritin is a mediator for immune dysregulation, especially in increase ferritin level, pro-inflammatory effects causes cytokine storms.[20] Previous study showed that liver injury is common in covid 19, During liver injury ferritin is discharged from destroyed hepatic cell, In This study we have found slightly increase level of ferritin and the which is supported by N Abbaspouret al.[22,23]

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Conclusion

In our study we have found altered levels of platelets, D dimer, CRP and serum ferritin in Covid 19 patients concluding this parameters as an independent useful accurate biomarkers for monitoring and management of covid 19 patients D dimer, C reactive protein, serum ferritin are an independent useful accurate biomarker.

The limitation of this study was the relatively low sample size and single centre, taking in to the consideration of large number of patients affected by Covid 19 globally. Limited number of hematological and biochemical markers are studied. With this study, we aimed to analyze the roles of certain hematological and biochemical parameters in patients diagnosed with COVID-19, as abnormality of biochemical profile increases the severity of illness. These markers and clinical characteristics need further investigation.

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