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Correlation Analysis between clinical severity and biochemical markers of Covid-19 in South Tamil Nadu -A Descriptive Study

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ABSTRACT

Background: Coronavirus disease 2019 (COVID-19) is a novel infectious disease caused by the Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) . The mortality rate in critically ill patients with COVID-19 is high. This study analyzed the correlation of vsrious biochemical markers to clinical severity .

Methodology: In this cross-sectional study consecutive 150 patients with confirmed COVID-19 result admitted to Tirunelveli medical college and hospital, Tirunelveli, Tamil Nadu from August 2020 to August 2021, were enrolled. The assessment of disease severity was done clinically and by estimation of Biochemical markers and hematological markers like serum glucose, serum urea, creatinine, liver function tests (AST and ALT, Total Protein, Albumin, ALP), C- reactive protein. The tests were done on the day of admission and repeated according to clinical condition. Result and statistics: Statistical analysis was done by SPSS 22. The study population included 150 hospitalized patients with confirmed COVID-19. In our study the age of the covid patients ranged from 18 to 85 years The Median age was 58 years. 88 were males (57.8%) and 66(42.2%) were females. The age group between 50 -69 years were affected more. As per Pearson correlation age has positive correlation with neutrophil count, lymphocyte count, Glucose, Urea, Creatinine and ferritin and ALP. Sex has positive correlation with ferritin (P< 0.05). Total white blood cell count has positive correlation with LDH, ferritin and D-dimer (P<=0.05). Neutrophil count has significant correlation with ESR, CRP and LDH. Lymphocyte count has significant positive correlation with LDH; Serum glucose has significant correlation with age, urea and creatinine; serum urea has significant correlation with age, LDH and ferritin. Serum Globulin positively correlated with bilirubin (p <0.01).Bilirubin level has positive correlation with CRP.

Conclusion: This study concludes that glucose, ferritin, LDH plays important diagnostic and prognostic role in Covid 19 infection. Sex doesn't have any significant role in prognosis. Age group 40-59 were prone for more infections with significant biochemical and hematological changes. This study concludes that Serum Glucose, Urea, ferritin, D-dimer, Lymphocyte count, Neutrophil count and CRP have significant role in prognosis and deciding management for Covid -19 positive patients.

I. INTRODUCTION

A novel coronavirus, designated as the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was first identified in Wuhan, China in December 2019 [1]. SARS-CoV- 2 is highly infectious and fatal. The asymptomatic patients may also become the source of infection.World Health Organization (WHO) announced that the disease caused by SARS-CoV-2 as coronavirus disease 2019 (COVID- 19) on February 11, 2020. Patients with COVID-19 have a series of clinical manifestations, such as cough, fatigue, throat pain, fever, anorexia, headache, diarrhea, nausea or vomiting, dyspnea, myalgiaand chest pain [2], acute respiratory distress syndrome. Compared to leading causes of death from the same period in 2018, novel COVID-19 was the third leading cause of death for children and adults (697.5 deaths/million), ranking only behind heart disease (1287.7 deaths/million) and cancer (1219.8 deaths/million). No age group has been spared, and during 2020 to 2021 COVID-19 presented with severe respiratory infection, thromboembolism, myocardial infarction, storm syndrome and even death.Although most patients with COVID-19 were mild during the initial illness, some patients progressed rapidly to acute respiratory failure, metabolic acidosis, septic shock, ARDS or death. Early identification of risk factors for critical patients could facilitate appropriate supportive care and thus reduce the mortality [3]. A study of the first 138 laboratory-confirmed cases with COVID-19 showed

the changes of neutrophil count, lymphocyte count, and D-dimer levels [4]. Increased inflammation - related indicators were found in patients with COVID- 19, including erythrocyte sedimentation rate (ESR), interleukin-6 and C-reactive protein (CRP) [5]. However, little is known about the relationship between disease severities and clinical and biochemical features in patients with COVID-19. So, there is need to diagnose and asses the covid 19 and its severity to prevent early morbidity and mortality. In this study, we aimed to analyze characteristics of 150 patients with COVID-19 admitted to Tirunelveli medical college, Tirunelveli, Tamil Nadu. This study retrospectively analyzed clinical characteristics and biochemical parameters between mild/moderate and severe/critical patients, which may help to identify critical cases and perform appropriate clinical intervention early.

II. MATERIALS AND METHODS

Study design and participants:

This study was a cross-sectional study, and all consecutive 150 patients with confirmed COVID-19 result admitted to Tirunelveli medical college and hospital, Tirunelveli, Tamil Nadufrom August 2020 to August 2021, were enrolled. Diagnosis of COVID-19 and clinical classification according to the new coronavirus pneumonia diagnosis and treatment plan (trial version 7) developed by WHO and ICMR India was used in the study.The study was approved by the Institutional Ethics Committees at Tirunelveli Medical College and Hospital.The assessment of diseaseseverity done by estimation of Biochemical markers and hematological Markers like serum glucose by GOD-POD method, Serum urea by Urease method, creatinine by Jaffey's method, liver function tests:AST and ALT by IFSC kinetic, Total Protein Biuret method, Albumin by BCG method, ALP C- reactive protein done in ERBO -360 ERBA and 640fully automated analyzer.D-dimer and hematological investigations including Complete Blood Count SYSMEX –XP 100Prothrombin Time, activated plasma thromboplastin timewere performed in ECL ERBA -412on the day of admission and repeated according to clinical condition.

Statistical Analysis

Data are transformed into a Microsoft Excel spreadsheet and analyzed using Statistical Package for Social Sciences (SPSS) Version 22.

Descriptive statistics;

Mean and standard deviations were used for the comparison of continuous variables ensuring normal distribution. Independent sample –t-test was applied to biochemical and hematological findings to non-survivors in COVID-19 patients. Pearson correlation was used to correlate various biochemical and hematological parameters.Categorical variables were given as frequency rates and percentages; continuous variables were defined using mean, median, and interquartile range (IQR) values. The independent sample t test or the Mann-Whitney U test was used for the continuous variables and the chi-square test for the categorical variables. In correlation analysis, Pearson correlation coefficient was used for the variables of normal distribution and Spearman correlation coefficient for those of skewed distribution. Receiver–operating characteristic (ROC) curve analysis was used to determine the optimum cut-off points of parameters for severe patients. A 2-tailed $P < 0.05$ was considered as statistically significant.

III. RESULTS

The study population included 150 hospitalized patients with confirmed COVID-19. In our study the age of the covid patients ranged from 18 to 85 years The Median age was 58 years. 88 were males (57.8%) and 66(42.2%) were females. The age group between 50 -69 years were affected more (39 %)followed by 30 -49 years (34%),18 – 29 years 14% and more than 70 years 13% (Table 1).Age and sex of the study population have been correlated with various biochemical and hematological parameters. Figure 1, shows the serum level of glucose in various age groups, higher in age group between 40 -60 years. Females have more glucose level in comparison with male patients. According to figure2 CRP levels were more in males than females and raised in age group between 50 -60 years. Glucose and CRP have significant changes in covid positive patients than ESR and urea level (Table 4). Mean and SD of Age: 49.48$\pm$ 17.191, Mean and SD of WBC 7440.06 $\pm$ 3298.731, Mean and SD of Glucose 134$\pm$ 71.7, Mean and SD of LDH 313.26$\pm$ 213.45, Mean and SD of D-dimer 427.1$\pm$ 526.49, Mean and SD of Ferritin 300$\pm$303.07, Mean and SD of Urea 37.9$\pm$26.41, Mean and SD of Creatinine 1.14$\pm$0.8, Mean and SD of CRP 24.9$\pm$41.3, Mean and SD of Sodium 140.59$\pm$595.9, Mean and SD of Potassium 5.2$\pm$6.2 (Table 5).As per Pearson correlation (Table 6)Age has positive correlation with neutrophil, lymphocyte, Glucose, Urea, Creatinine and ferritin

and ALP.Age hasnegative correlation with ESR, CRP, D-dimer, LDH and Bilirubin. Sex has positive correlation with ferritin (P< 0.05) and negative correlation with all other parameters. Total white blood cell counts have positive correlation with LDH, ferritin and D-dimer (P<=0.05). Neutrophil counts have significant correlation with ESR, CRP and LDH. Lymphocyte counts have significant positive correlation with LDH; Serum glucose has significant correlation with age, urea and creatinine;serum urea has significant correlation with age, LDH and ferritin. Serum Globulin positively correlated with bilirubin (p <0.01). Serum Bilirubin level has positive correlation with CRP.

IV. DISCUSSION:

COVID-19 constitutes a major public health problem at world level and is related with multiple complications that affect both the health of patients and the socio- economic status of the patient. For this reason, clinical laboratories can contribute to establishing biomarkers that would make it possible to stratify the risk of patients evolving toward more serious conditions, thus expediting clinical decision regarding management.

There are seven types of HCoV identified till date out of which four of them usually results in mild acute respiratory illness. The four types of HCoV are HCoV-229E (α-CoV), HCoV-NL63 (αCoV), HCoV- OC43 (β-CoV), and HCoV-HKU1 (β-CoV) [11-13]. The severity of HCoV induced upper respiratory tract infection may range from mild to severe, depending upon the individual's age. And also, those people al- ready having problems related to lung and cardiac may exhibit severe infectious conditions [6]. The remaining three viruses SARS-CoV, MERS-CoV, and SARS-CoV-2, are found to be deadly pathogenic, causing ARDS, hepatic diseases, intestinal diseases, multiple organ failure, and eventually, may lead to death in severe cases [6,7,8]. The older population hasmore number of comorbidities, limited organ function, reduced lung capacity, impaired immune system, biological aging, and more severe complications, these are the common reason pointed in earlier research on elderly with COVID-19, hence clinicians should treat them with more attention considering high-risk group.9,10

Although predisposing factors have been defined (gender, risk ages and association with pathologies such as obesity, diabetes and hypertension), it is ultimate to use biomarkers that would allow a distinction to be made in concerning the progression of the disease and helps to decide the management for patients and helps to decide which patient could require advanced medical procedures, thus making possible a focalized use of clinical resources. The available evidence shows that patients with severe and critical cases present various alterations in their laboratory parameters, and in some cases rapidly progress toward ARDS and septic shock followed by multiple organ failure [11,12]. In some studies Kidney function biomarkers such as serum creatinine were in general observed to be within the reference range [13, 14, 15] and no statistically significant differences were found between the mean values of patients with mild and severe conditions on admission. During the time of hospitalization, however, it was observed that the non-surviving patients had a progressive increase (approximately as of day 10 after admission) above the reference range, reaching a peak a few days before they died. Therefore, biomarkers could be used to assess the prognosis of patients in the course of their hospitalization. Renal dysfunction in non-severe COVID-19 cases was minor and was not diagnosed as acute kidney injury. Patients with end-stage renal disease (ESRD) are particularly vulnerable to severe COVID-19 due to the advanced age and high frequency of comorbidity such as diabetes and hypertension in this population. 13, 14, 15

Age has positive correlation with neutrophil, lymphocyte, Glucose, Urea, Creatinine and serum ferritin and ALP (P< 0.05) and has negative correlation with ESR, CRP, D-dimer, LDH and Bilirubin, (Table 6). Sex has Positive correlation with ferritin (P< 0.05) and negative correlation with all other parameters.Total white blood cell count has positive correlation with LDH, ferritin and D-dimer (P<0.05), Neutrophil count has significant positive correlation with ESR, CRP and LDH (P<0.05) and Lymphocytes have significant positive correlation with LDH. Serum glucose have significant correlation with Age, Urea and creatinine (P<0.05), Serum urea has significant correlation with Age, LDH and ferritin (P<0.05), Serum Globulin positively correlated with bilirubin (p <0.01), Bilirubin level have positive correlation with CRP (P<0.05). 16,17

In Covid patients, hyperglycemia is a common in age more than 40 years which also implies covid severity is related to diabetes; in our study hyperglycemia is predominant in female than in male (figure1). ESR elevation was noted in all age

groupsand was not specific to age and sex. Total WBC count less than 5000 was noted in 24 % of infected covid patients, 50000 -11000 in 67% and more than 11000 in 9%. CRP was elevated more in age group of more than 30 years and male (figure 2). CRP has positive correlation in patient with Neutrophil, Urea and ESR (table 4). LDH has significant changes in covid patients and positively correlated with WBC, Neutrophil count, Lymphocyte count and Glucose. D –dimer has positive correlation with lymphocyte, urea, ESR and aPTT andferritin has positive correlation with total count, neutrophil count and lymphocyte count. AST, ALT, protein, albumin and globulin did not show any significant correlation (table 6) 18,19,20

In our study the age of the covid patients ranged from 18 to 85 years The Median age was 58 years. Total male patient 89 (57.8%) and total female patients 65(42.2%), the age group between 50 -69 years were affected more 39 %, 12 – 29 years 14% 30 -49 years 34% and more than 70 years 13% (Table 1). Total number of males affected in our study 88(57.8 %), Total females affected 66 (42.2%). Age and sex of the study population have been correlated with various Biochemical and hematological parameters. Figure 1, shows the serum level of glucose in various age groups, higher in age group between 40 -60 years and females have more glucose level in comparison with male patients. Figure2 shows CRP level is more in male than female and raised in age group between 50 -60 years. Table 4 shows glucose and CRP have significant changes in covid positive patients than ESR and urea level. Table 5 shows mean and standard deviations of various biochemical and hematological parameters in covid -19 patients involved in our study. According to Pearson correlation table 6, Age: positive correlation with neutrophil, lymphocyte, Glucose, Urea, Creatinine and ferritin and ALP. Negative correlation with ESR, CRP, D-dimer, LDH and Bilirubin Sex: Positive correlation with ferritin P< 0.05 and negative correlation with all other parameters. Total white blood cell counts have positive correlation with LDH, ferritin and D-dimer (P<=0.05). Neutrophil counts have significant changes with ESR, CRP and LDH, Lymphocytes have significant positive correlation with LDH. Serum glucose has significant correlation with age, urea and creatinine. Serum urea has significant correlation with age, LDH and ferritin. Serum globulin positively correlated with bilirubin (p <0.01). Bilirubin level has positive correlation with CRP.

V. CONCLUSION

As per this study finding concern, patient characteristics, including age, leucocyte count, platelet count, inflammatory markers status. COVID-19 is an unpredictable,

In conclusion, clinical laboratories play a pivotal role in the SARS-CoV-2 pandemic, not only in a diagnostic point of view but also in terms of the prognosis of COVID-19 patients, determining the degree of metabolic disorder of the patients and favoring the development of support tools for clinical decision making in order to adjust the therapy to the biological changes experienced by the subjects. Likewise, the laboratory work allows optimizing the hospital environment resources of the critical units of the health systems, resulting in the enhancement of the response time and efficiency of this response. This study concludes that glucose, ferritin, LDH plays important diagnostic and prognostic role in Covid 19 infection. Sex doesn't have any significant role in prognosis. Age group 40-60 were prone for more infections with significant biochemical and hematological changes. This study concludes that Serum Glucose, Urea, ferritin, D-dimer, Lymphocyte, Neutrophils and CRP have significant role in prognosis and deciding management for Covid -19 positive patients.

Conflict of interest
Nil

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Table 1: Distribution of age in covid -19 patients

S.No	Age Group(years)	Numbers	Percentage
1	18- 29	22	14
2	30-49	52	34
3	50-69	60	39
4	> 70	20	13

The Median age was 58 years. 88 were males (57.8%) and 66(42.2%) were females. The age group between 50 -69 years were affected more (39 %) followed by 30 -49 years (34%),18 – 29 years 14% and more than 70 years 13%(Table 1).

Table 2: **Sex distribution in Covid -19 infection**

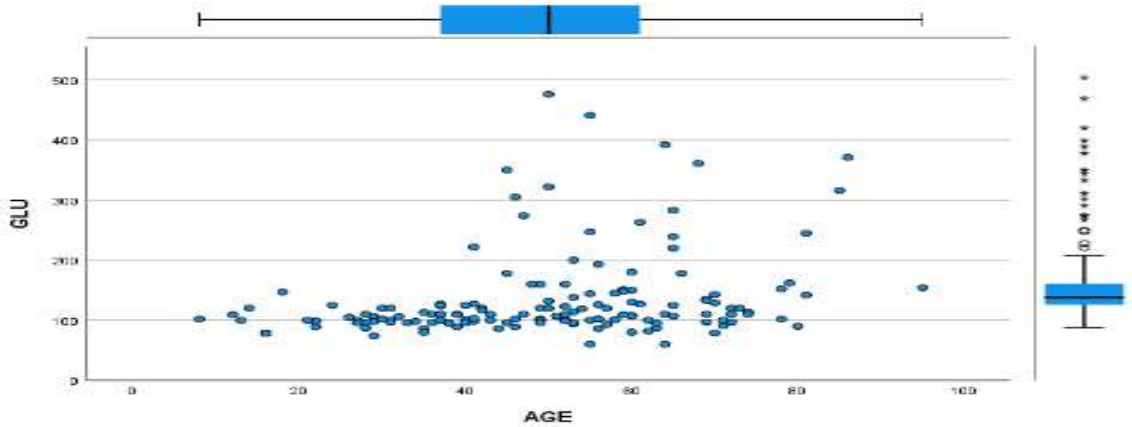
S. No	Sex	Numbers	Percentage
1	Male	88	57.8
2	Female	66	42.2
Total		154	100

Percentage of Males involved in this study: 57.8
Percentage of Females involved in this study: 42.2

TABLE 3: NEUTROPHIL / LYMPHOCYTE RATIOin patient with Covid -19

Group	N	Price Related Bias	Price Related Differential	Coefficient of Dispersion
1	89	-5.613	1.874	1.15
2	65	-5.907	1.969	1.214
Overall	154	-5.717	1.921	1.178

Figure 1: Distribution of Serum glucose in various Age group and sex



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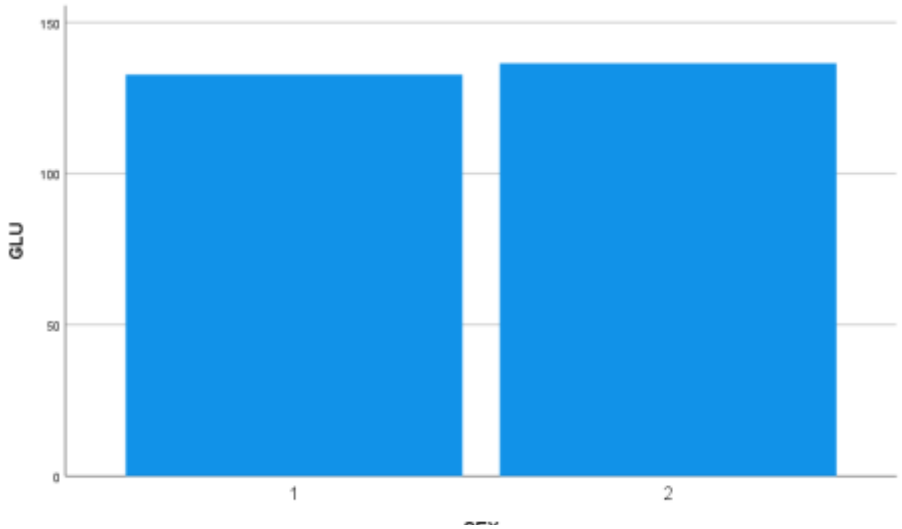

Figure 2: Distribution of Serum C- reactive Protein in various Age group and sex

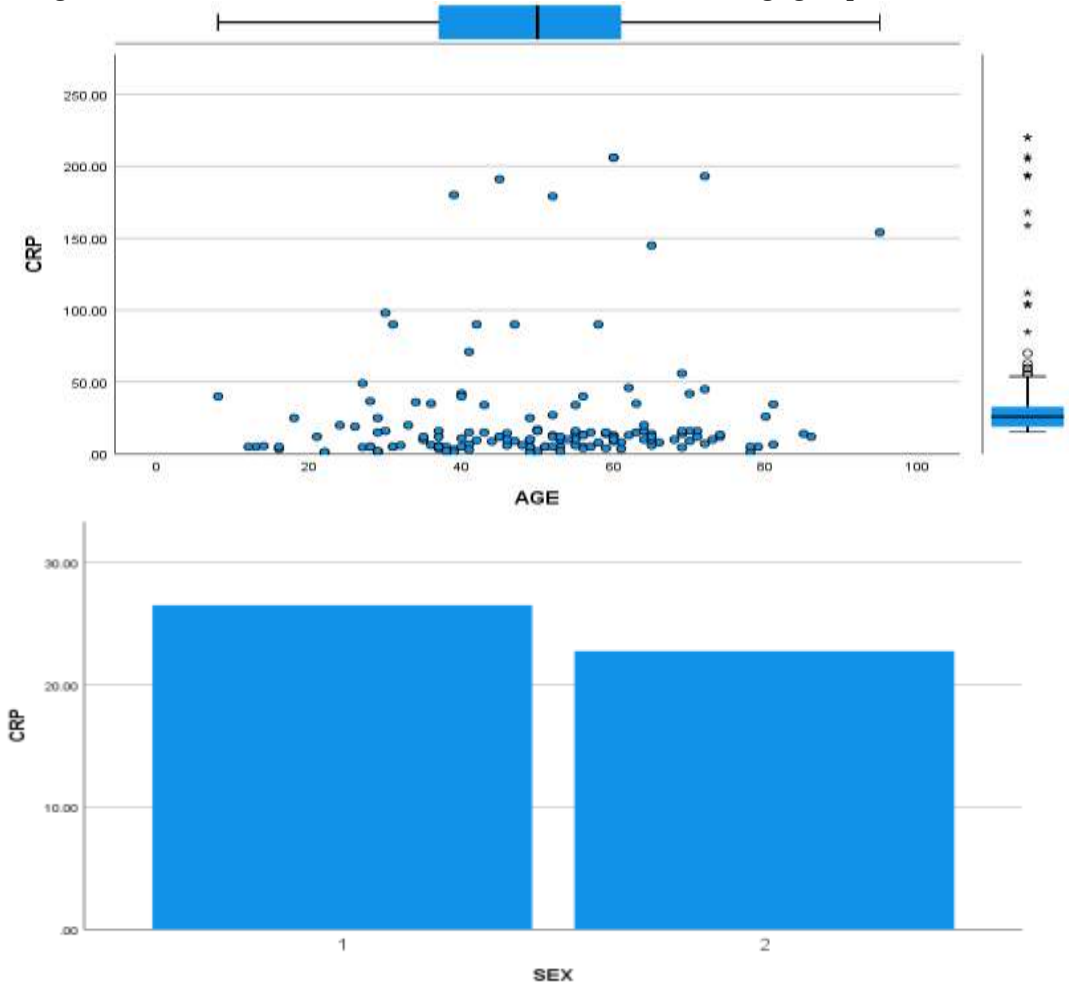

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Table 4 Chi-square test:

	AGE	SEX	ESR	GLU	CRP	D-dimer	LDH	Ferritin
Chi-Square	57.948[a]	3.740[b]	67.506[c]	199.000[d]	306.299[e]	93.351[f]	46.909[g]	64.571[h]
df	63	1	51	76	66	106	118	98
Asymp. Sig.	0.656	0.053	0.061	0.001	0.001	0.805	1	0.996

As per table 4: Serum glucose, Serum creatinine have Signiant changes in Covid 19 patient's p< 0.001

Table 5: Mean and standard deviation of various Biochemical and hematological parameters of Covid Patients involved in our Study

	Mean	Std. Deviation(+-)	Std. Error Mean
Age	49.48	17.19	1.38
Neutrophil count	69.57	14.22	1.15
WBC	7440.06	3298.73	265.82
Glucose	134.28	71.77	5.78
Urea	37.9	26.42	2.13
Creatinine	1.14	0.83	0.07
ESR	43.97	27.57	2.22
Lymphocyte count	24.4	13.55	1.09
CRP	24.93	41.35	3.33
LDH	313.27	213.46	17.20
D-dimer	427.13	526.5	42.42
Ferritin	300.23	303.07	24.42
Sodium	140.59	5.94	0.84
Potassium	5.204	6.22	0.88
APTT	33.69	12.08	1.71
PT	11.64	1.59	0.22

Table5:Mean and SD of Age: 49.48$\pm$17.191, Mean and SD of WBC 7440.06 $\pm$ 3298.731, Mean and SD of Glucose134$\pm$71.7, Mean and SD of LDH 313.26$\pm$213.45,Mean and SD of D-dimer 427.1$\pm$ 526.49, Mean and

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SD of Ferritin 300+303.07, Mean and SD of Urea 37.9+26.41, Mean and SD of Creatinine 1.14+0.8, Mean and SD of CRP 24.9+41.3, Mean and SD of Sodium 140.59+595.9, Mean and SD of Potassium 5.2+6.2.

Table 6: Pearson correlation of various Biochemical markers analyzed in this study with Age and Sex of the patients

		AGE	SEX	WBC	NEUTRO	LYMPHO	GLU	UREA	CRE	ESR	CRP	LDH	D-dimer	Ferritin	Platelet	PT	APTT	T.BIL	D.BIL	IN.BIL	ALT	AST	ALP
AGE	Pearson	1.00	0.11	0.09	0.26	-215.00	0.28	0.26	0.27	0.04	0.12	0.08	-0.12	0.17	-0.05	0.26	0.09	0.08	0.16	0.26	-0.01	0.06	-0.28
	Sig. (2-tailed)		0.16	0.28	0.00	0.01	0.00	0.00	0.00	0.63	0.14	0.34	0.15	0.04	0.57	0.07	0.52	0.57	0.27	0.07	0.95	0.70	0.05
SEX	Pearson	0.11	1.00	-0.06	0.08	-0.08	0.03	0.00	-0.01	-0.01	-0.05	0.01	-0.03	-0.15	-0.07	0.05	-0.18	0.16	0.19	0.17	0.00	0.13	-0.06
	Sig. (2-tailed)	0.16		0.46	0.33	0.34	0.74	0.96	0.88	0.95	0.58	0.91	0.74	0.05	0.39	0.73	0.21	0.28	0.18	0.24	1.00	0.39	0.68
WBC	Pearson Correlation	0.09	-0.06	1.00	0.35	0.34	0.19	0.09	0.01	0.18	0.15	0.22	-0.15	0.23	0.00	-0.25	0.18	-0.20	-0.22	0.01	-0.17	-0.07	0.01
	Sig. (2-tailed)	0.28	0.46		0.00	0.00	0.01	0.26	0.94	0.03	0.07	0.01	0.07	0.00	0.97	0.08	0.21	0.16	0.13	0.97	0.24	0.63	0.97
NEUTRO	Pearson Correlation	0.26	0.08	0.35	1.00	0.96	0.11	0.06	0.12	0.18	0.23	0.16	-0.14	0.15	-0.06	0.02	0.00	0.03	0.07	0.23	0.00	0.08	0.17
	Sig. (2-tailed)	0.00	0.33	0.00		0.00	0.17	0.50	0.13	0.02	0.00	0.05	0.09	0.06	0.46	0.88	0.98	0.83	0.65	0.11	0.98	0.59	0.24
LYMPHO	Pearson Correlation	0.22	0.08	0.34	0.96	1.00	0.07	0.07	0.10	0.17	0.22	0.18	0.16	0.14	0.07	0.02	0.01	0.09	0.09	0.18	0.01	0.09	0.19
	Sig. (2-tailed)	0.01	0.34	0.00	0.00		0.43	0.41	0.21	0.04	0.01	0.03	0.06	0.08	0.40	0.92	0.94	0.56	0.56	0.22	0.95	0.53	0.20
GLU	Pearson Correlation	0.28	0.03	0.20	0.11	0.07	1.00	0.29	0.30	0.12	0.08	0.11	-0.09	0.04	0.04	0.01	0.04	0.18	0.16	0.09	0.01	0.16	0.14
	Sig. (2-tailed)	0.00	0.75	0.01	0.17	0.43		0.00	0.00	0.13	0.35	0.16	0.29	0.60	0.60	0.94	0.77	0.21	0.27	0.54	0.94	0.27	0.35
UREA	Pearson Correlation	0.26	0.00	0.09	0.06	-0.07	0.29	1.00	0.44	-0.12	-0.05	0.17	0.16	0.02	-0.03	0.08	0.18	-0.07	-0.09	0.24	0.10	0.11	0.01
	Sig. (2-tailed)	0.00	0.96	0.26	0.50	0.41	0.00		0.00	0.13	0.51	0.04	0.05	0.79	0.71	0.61	0.20	0.62	0.56	0.09	0.50	0.47	0.95
CREA	Pearson Correlation	0.27	-0.01	0.01	0.12	0.10	0.29	0.44	1.00	0.02	0.00	0.05	0.13	0.02	0.03	0.02	0.02	0.11	0.06	0.54	0.09	0.02	0.04
	Sig. (2-	0.00	0.88	0.94	0.13	0.21	0.00	0.00		0.84	0.99	0.57	0.10	0.78	0.68	0.9	0.91	0.46	0.70	0.00	0.56	0.87	0.81

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	tailed)															2							
ESR	Pearson Correlation	0.04	-0.01	.180*	0.18	0.17	0.12	-0.12	-0.02	1.00	0.51	-0.03	0.23	0.08	0.02	-0.15	0.05	-0.04	-0.02	-0.06	-0.12	-0.18	0.06
	Sig. (2-tailed)	0.63	0.95	0.03	0.02	0.04	0.13	0.13	0.84		0.00	0.68	0.00	0.31	0.85	0.30	0.72	0.76	0.90	0.66	0.40	0.21	0.67
CRP	Pearson Correlation	0.12	-0.05	0.15	0.23	-0.22	-0.08	-0.05	0.00	0.51	1.00	0.01	0.09	0.04	0.03	0.05	-0.07	0.17	0.28	0.23	-0.14	-0.09	-0.02
	Sig. (2-tailed)	0.14	0.58	0.07	0.00	0.01	0.35	0.51	0.99	0.00		0.94	0.26	0.62	0.72	0.75	0.62	0.25	0.05	0.11	0.33	0.55	0.92
LDH	Pearson Correlation	0.08	0.01	0.22	0.16	-0.18	0.11	0.17	0.05	-0.03	0.01	1.00	-0.12	0.10	0.08	0.13	0.21	0.06	0.12	-0.03	0.24	0.08	0.05
	Sig. (2-tailed)	0.34	0.91	0.01	0.05	0.03	0.16	0.04	0.57	0.68	0.94		0.13	0.21	0.33	0.35	0.15	0.66	0.41	0.82	0.10	0.57	0.74
D-dimer	Pearson Correlation	0.12	0.03	0.15	0.14	0.16	0.87	0.16	0.13	0.23	0.09	0.12	1.00	0.03	0.06	0.22	0.55	0.05	0.06	0.05	0.14	0.13	0.00
	Sig. (2-tailed)	0.15	0.74	0.07	0.09	0.06	0.29	0.05	0.10	0.00	0.26	0.13		0.76	0.48	0.13	0.00	0.72	0.67	0.74	0.35	0.39	1.00
Ferritin	Pearson Correlation	0.17	-0.15	0.23	0.15	-0.14	0.04	0.02	-0.02	0.08	0.04	0.10	0.03	1.00	-0.05	0.05	-0.04	0.00	-0.08	-0.11	-0.19	0.03	-0.20
	Sig. (2-tailed)	0.04	0.06	0.00	0.06	0.08	0.60	0.79	0.78	0.31	0.62	0.21	0.76		0.51	0.74	0.79	1.00	0.59	0.44	0.20	0.85	0.17
Platelet	Pearson Correlation	-0.05	-0.07	0.00	-0.06	0.07	0.04	-0.03	-0.03	0.02	0.03	-0.08	-0.06	-0.05	1.00	0.15	0.22	-0.12	-0.09	-0.12	-0.27	-0.16	-0.03
	Sig. (2-tailed)	0.57	0.39	0.97	0.46	0.40	0.60	0.71	0.68	0.85	0.72	0.33	0.48	0.51		0.30	0.12	0.41	0.52	0.41	0.06	0.28	0.86
PT	Pearson Correlation	0.26	0.05	-0.25	0.02	-0.02	-0.01	0.08	-0.02	-0.15	0.05	0.13	0.22	0.05	0.15	1.00	0.16	0.01	0.06	-0.05	-0.09	0.11	-.314*
	Sig. (2-tailed)	0.07	0.73	0.08	0.88	0.92	0.94	0.61	0.92	0.30	0.75	0.35	0.13	0.74	0.30		0.26	0.97	0.66	0.72	0.55	0.46	0.03
APTT	Pearson Correlation	0.09	-0.18	0.18	0.00	-0.01	-0.04	0.18	-0.02	0.05	-0.07	0.21	.549**	-0.04	0.22	0.16	1.00	-0.19	-0.16	-0.18	-0.10	-0.14	0.02
	Sig. (2-tailed)	0.52	0.21	0.21	0.98	0.94	0.77	0.20	0.91	0.72	0.62	0.15	0.00	0.79	0.12	0.26		0.20	0.27	0.22	0.51	0.35	0.87
T.BIL	Pearson Correlation	0.08	0.16	-0.20	0.03	-0.09	-0.18	-0.07	0.11	-0.04	0.17	0.06	-0.05	0.00	-0.12	0.01	-0.19	1.00	.948**	.371**	-0.08	0.12	-0.05

	Sig. (2-tailed)	0.57	0.28	0.16	0.83	0.56	0.21	0.62	0.46	0.76	0.25	0.66	0.72	1.00	0.41	0.97	0.20		0.00	0.01	0.58	0.41	0.74
D.BIL	Pearson Correlation	0.16	0.19	-0.22	0.07	-0.09	0.16	0.09	0.06	0.02	0.28	0.12	-0.06	0.08	0.09	0.06	-0.16	.948	1.00	.291	-0.03	0.18	-0.06
	Sig. (2-tailed)	0.27	0.18	0.13	0.65	0.56	0.27	0.56	0.70	0.90	0.05	0.41	0.67	0.59	0.52	0.66	0.27	0.00		0.04	0.82	0.23	0.67
IN.BIL	Pearson Correlation	-0.26	0.17	0.01	-0.23	0.18	-0.09	0.24	.539	-0.06	0.23	-0.03	0.05	-0.11	-0.12	-0.05	-0.18	.371	.291	1.00	-0.08	-0.06	.385*
	Sig. (2-tailed)	0.07	0.24	0.97	0.11	0.22	0.54	0.09	0.00	0.66	0.11	0.82	0.74	0.44	0.41	0.72	0.22	0.01	0.04		0.59	0.70	0.01
ALT	Pearson Correlation	-0.01	0.00	-0.17	0.00	0.01	0.01	0.10	0.09	-0.12	-0.14	0.24	0.14	-0.19	-0.27	-0.09	-0.10	-0.08	-0.03	-0.08	1.00	.665*	0.10
	Sig. (2-tailed)	0.95	1.00	0.24	0.98	0.95	0.94	0.50	0.56	0.40	0.33	0.10	0.35	0.20	0.06	0.55	0.51	0.58	0.82	0.59		0.00	0.48
AST	Pearson Correlation	0.06	0.13	-0.07	0.08	-0.09	-0.16	0.11	0.02	0.18	0.09	0.08	0.13	0.03	0.16	0.11	0.14	0.12	0.18	-0.06	0.67	1.00	0.12
	Sig. (2-tailed)	0.70	0.39	0.63	0.59	0.53	0.27	0.47	0.87	0.21	0.55	0.57	0.39	0.85	0.28	0.46	0.35	0.41	0.23	0.70	0.00		0.42
ALP	Pearson Correlation	0.28	-0.06	0.01	0.17	0.19	0.14	0.01	0.04	0.06	0.02	0.05	0.00	0.20	0.03	0.31	0.02	0.05	0.06	0.39	0.10	0.12	1.00
	Sig. (2-tailed)	0.05	0.68	0.97	0.24	0.20	0.35	0.95	0.81	0.67	0.92	0.74	1.00	0.17	0.86	0.03	0.87	0.74	0.67	0.01	0.48	0.42	
T.pro	Pearson Correlation	0.15	-0.11	0.15	0.14	-0.20	0.08	-0.09	-0.17	0.12	-0.18	0.07	0.05	-0.01	.283	-0.06	0.17	-0.11	-0.18	0.34	0.13	0.18	0.30
	Sig. (2-tailed)	0.31	0.45	0.31	0.35	0.16	0.58	0.54	0.25	0.41	0.23	0.63	0.75	0.96	0.05	0.68	0.26	0.45	0.23	0.02	0.38	0.21	0.04
Alb	Pearson Correlation	0.14	-0.13	0.07	0.06	-0.11	0.13	-0.01	-0.05	0.11	-0.08	0.01	-0.09	-0.07	0.20	-0.05	0.11	0.05	0.08	-0.16	-0.19	-0.22	-0.26
	Sig. (2-tailed)	0.34	0.37	0.64	0.69	0.45	0.38	0.95	0.75	0.46	0.60	0.94	0.55	0.65	0.17	0.75	0.47	0.74	0.57	0.27	0.20	0.14	0.07
Globulin	Pearson Correlation	0.10	-0.05	0.16	0.15	-0.21	0.01	0.13	0..214	0.08	-0.20	0.10	0.15	0.05	0.25	-0.05	0.16	-0.21	0.36	0.37	0.02	0.08	0.22
	Sig. (2-tailed)	0.49	0.74	0.27	0.29	0.15	0.96	0.39	0.14	0.55	0.17	0.52	0.31	0.74	0.08	0.74	0.28	0.14	0.01	0.01	0.87	0.58	0.14

Table 6: Age has positive correlation with neutrophil, lymphocyte, Glucose, Urea, Creatinine and ferritin and ALP. Sex has positive correlation with ferritin (P< 0.05). Total white blood cell have positive correlation with LDH, ferritin and D-dimer (P<=0.05). Neutrophils have significant changes with ESR, CRP and LDH. Lymphocytes have significant positive correlation with LDH; Serum glucose has significant correlation with age, urea and creatinine; serum urea has significant correlation with age, LDH and ferritin. Serum Globulin positively correlated with bilirubin (p <0.01).Bilirubin level has positive correlation with CRP.