

ORIGINAL RESEARCH

Lab Parameter among Corona Patients

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ABSTRACT

Introduction: The COVID-19 pandemic has been raging across the globe since early January 2020. Various geographical regions have been passing multiple swells of upsurge of cases which aren't matched temporally as well as in severity. The diapason of the complaint ranges from asymptomatic to severe life-hanging complaint. Advanced age and the presence of comorbidities similar as cardiovascular complaint, diabetes mellitus, hypertension, chronic lung complaint, chronic kidney complaint, cancer, and obesity are among the major threat factors for severe disease.

Aims and objectives: Significance of lab parameter among Corona Patients. **Materials and methods:** The covid- 19 opinion was verified by reverse transcription- polymerase chain reaction (RT- PCR) assay of nasopharyngeal swab sample. Hematology blood samples were used to analyze by flow cytometry. Biochemical samples were used to analyze by completely auto analyzer diagnostic outfit. Serology tests were carried out the styles based on indirect ELISA technique, immune plates are coated with a admixture of purified viral antigen and probe using the patient serum.

Results: It is found that there is statistically significant ($p\text{-value}<0.05$) mean difference within the lab parameters (IL-6, LDH and Ferritin) in Covid patients using the Post Hoc Analysis. It is also found that there statistically significant ($p\text{-value}<0.05$) mean difference between RBC, Hb level, Hematocrit, MCV, MCH, MCHC, Platelet, RDW, PCT and NL ratio while Age, WBC, MPV, M(Monocyte), E(Eosinophil), B(Basophil), D-dimer and PDW were found to be statistically insignificant ($p\text{-value}>0.05$) with respect to gender.

Discussion: CBC, D- dimer, IL-6, LDH and Ferritin were analysed and found associated with adverse outcomes. There is significant association of age, gender, comorbidity.

Conclusion: High NLR at admission associated with a higher mortality. Laboratory features (e.g., IL-6, LDH, Ferritin D-dimer etc.) were associated with poor outcomes

Keywords: COVID-19, Coronavirus, Laboratory findings

INTRODUCTION

The COVID-19 pandemic has been raging across the globe since early January 2020. Various geographical regions have been passing multiple swells of upsurge of cases which aren't

matched temporally as well as in severity. An analogous caution was seen during the 1918 influenza pandemic [1].

Deduced from the Latin term corona meaning crown, due to their characteristic appearance on electron microscopy, coronaviruses are a group of RNA contagions that are important beast and mortal pathogens. Cross-species transmission of some of these contagions led to the Severe acute respiratory syndrome (SARS) outbreak in 2002 to 2003 and the Middle East Respiratory Syndrome (MERS) outbreak in 2012.[2]

A cluster of severe pneumonia cases in Wuhan, China, in December 2019, led to the identification of a novel coronavirus which was more contagious than the SARS and MERS coronavirus; and the ailment was designated coronavirus ailment 2019(COVID-19) by the World Health Organization(WHO) and the contagion was named SARS- Coronavirus 2(SARS-CoV- 2). The contagion spread fleetly due to human- to-human transmission and was characterized as a pandemic by the WHO on March 11,2020the first coronavirus to bring a pandemic.[2]

COVID-19 virus is mainly spread from person to person via respiratory droplet transmission, which occurs when a person is in close contact with someone who is actively coughing or sneezing. This occurs through exposure of the mucosal surfaces of the host, that is, eyes, nose and mouth, to the incoming infective respiratory droplets.[3]

The contagion is transmitted via respiratory droplets and aerosols from person to person. Once within the body, the virus binds to host receptors and enters host cells through endocytosis or membrane fusion.[4]

ACE- 2 has been linked as a functional receptor for SARS- CoV and is largely expressed on the pulmonary epithelial cells.[5]

The diapason of the complaint ranges from asymptomatic to severe life- hanging complaint. Advanced age and the presence of comorbidities similar as cardiovascular complaint, diabetes mellitus, hypertension, chronic lung complaint, chronic kidney complaint, cancer, and obesity are among the major threat factors for severe disease.[2]

IL-6, the most common type of cytokine released by activated macrophages rise sharply in severe manifestations of COVID-19 [6]

LDH is an important marker of lung damage may explain, at least partly, why this enzyme's level is elevated in mostCOVID-19 patients [7].

Ferritin is a positive acute phase reactant and serum level of this intracellular protein increases during inflammation, dying cells may also release ferritin. Thus, it is reasonable to assume that higher serum ferritin levels in severely affected COVID-19 patients might indicate a greater extent of organ damage. [7]

D-dimer originate from the lysis of cross-linked fibrin with rising levels indicating the activation of coagulation and fibrinolysis [8].

As seen with previous coronavirus outbreaks, COVID-19 infection leads to severe hematological changes leading to thrombocytopenia. [9]

AIMS AND OBJECTIVES

Significance of lab parameter among Corona Patients

MATERIALS AND METHODS

The study conducted at Mahatma Gandhi Hospital, Jaipur, Rajasthan, India, a tertiary care center.

The covid- 19 opinion was verified by reverse transcription- polymerase chain reaction (RT-PCR) assay of nasopharyngeal swab sample. Hematology blood samples were used to analyze by flow cytometry. Biochemical samples were used to analyze by completely auto analyzer diagnostic outfit. Serology tests were carried out the styles based on indirect ELISA

technique, immune plates are coated with a admixture of purified viral antigen and probe using the patient serum.

INCLUSION CRITERIA

- Test positive for COVID-19 by RT-PCR.
- Informed consent.

EXCLUSION CRITERIA

None.

DATA COLLECTION AND ANALYSIS

We accessed the physical case records retrospectively and relevant information (demographics, laboratory investigations) were entered on a study proforma, which was later entered into Excel.

RESULTS

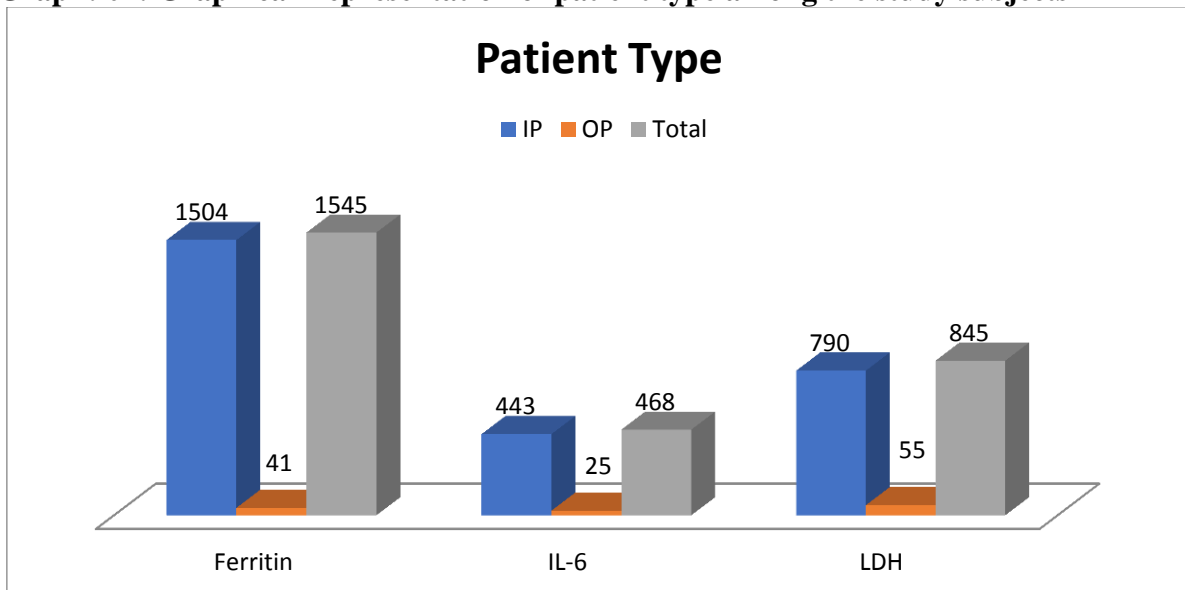
A total of 1545 patients (For Ferritin), 845 patients (For LDH), 468 patients (for IL-6), 500 Patients (For CBC), and 40 Patients (For D-Dimer) were included in analysis (Corona Positive) at Mahatma Gandhi Hospital.

Table: 01: Distribution of Age according to the Lab parameters in the study subjects:

Lab Parameters	Variable Name	N	Minimum	Maximum	Mean	Std. Deviation
IL-6	AGE	468	11.66	70.01	47.5304	15.58976
LDH		845	2.00	70.05	46.5933	17.35349
Ferritin		1545	2.00	70.05	47.2808	17.01640

The above table illustrates the distribution of age as per different groups i.e. IL-6, LDH and Ferritin. It is found that mean age of study subjects were 47.53 ± 15.58 in IL-6 followed by 46.59 ± 17.35 in LDH and 47.28 ± 17.01 in Ferritin. The maximum age was found in the IL-6 group.

Graph: 01: Graphical Representation of patient type among the study subjects



The above graph shows the Inpatient and outpatient burden as per groups. It was found that there are total 1545 patients in Ferritin group, out of which 1504 are inpatients and 41 are outpatients. In IL-6 group, total 468 patients were enrolled, out of which 443 were inpatients

and 25 were outpatients. In LDH group, total 845 patients were recruited, out of which 790 were inpatients and 55 were outpatients.

Table: 02: Distribution of Lab parameters in the study subjects

Lab Parameters	No. of Samples	Minimum	Maximum	Mean \pm S.D.
IL-6	468	0.00	2507.50	114.19 \pm 36.80
Ferritin	1545	0.00	50000.00	872.84 \pm 250.36
LDH	819	71.60	12536.60	547.06 \pm 118.64

The above table illustrates the distribution of lab parameters in different groups i.e.IL-6, LDH and Ferritin. It is found that mean value in IL-6 group was 114.19 \pm 36.80 followed by 872.84 \pm 250.36 in Ferritin group and 547.06 \pm 118.64 in LDH group.

Table: 03: Comparison of mean difference between the groups in the study subjects

Lab Parameters	Mean Square	F value	p-value
Between Groups	109866251.533	30.225	.0012
Within Groups	3634932.376		

The above table illustrates the mean difference between the lab parameters in the study subjects. It is found that there statistically significant (p-value<0.05) mean difference between the lab parameters in Covid patients.

Table: 04: Comparison of mean difference within the groups (Post Hoc Analysis) in the study subjects

Groups		Mean Difference (I-J)	95% Confidence Interval		p-value
			Lower Bound	Upper Bound	
IL-6	Ferritin	-758.65574	-994.5482	-522.7633	.021
	LDH	-432.87195	-691.9340	-173.8099	.001
Ferritin	IL-6	758.65574	522.7633	994.5482	.024
	LDH	325.78380	132.5438	519.0238	.003
LDH	IL-6	432.87195	173.8099	691.9340	.015
	Ferritin	-325.78380	-519.0238	-132.5438	.001

The above table illustrates the mean difference within the lab parameters in the study subjects. It is found that there is statistically significant (p-value<0.05) mean difference within the lab parameters in Covid patients using the Post Hoc Analysis.

Table: 05: Distribution of socio-demographic variables and laboratory investigations.

Descriptive Statistics	N	Minimum	Maximum	Mean	Std. Deviation
Age	499	1	70	43.90	15.951
WBC	500	1.19	48.79	7.6700	4.74905
RBC	500	1.99	6.57	4.4448	.69522
Hb	500	5.6	18.1	12.683	2.0193
MCV	500	8.7	122.7	88.061	9.9089
MCH	500	17.4	87.3	28.856	4.3153
MCHC	500	22.1	36.5	32.414	1.4982
Platelet	500	22.6	3030.0	221.269	153.747
NLR	498	.296	53.89	5.884	7.79
PT	1	12.0	12.0	12.000	0
INR	1	1.0	1.0	1.000	0
D-dimer	40	102.0	5136.0	420.850	179.684

The above table illustrates the distribution of socio-demographic and laboratory parameters among the 500 study subjects. It was found that mean age as 43.90 ± 15.95 , WBC as 7.67 ± 4.74 , RBC as 4.44 ± 0.69 , Hb level as 12.68 ± 2.01 , MCV as 88.06 ± 9.90 , MCH as 28.85 ± 4.31 , MCHC as 32.41 ± 1.49 , Platelet as 221.26 ± 153.74 , NL ratio as 5.88 ± 7.79 and D-dimer as 420.85 ± 179.68 among the study subjects.

Table: 06: Comparison of socio-demographic variables and laboratory investigations according to gender.

Variables Name	Sex	N	Mean	Std. Deviation	p-value
Age	M	340	43.52	15.956	.468
	F	158	44.63	15.981	
WBC	M	340	7.8626	5.31456	.207
	F	158	7.2846	3.22023	
RBC	M	340	4.5516	.70887	.000
	F	158	4.2129	.60442	
Hb	M	340	13.222	1.9244	.000
	F	158	11.494	1.6825	
Hematocrit	M	340	40.69	6.871	.000
	F	157	35.94	5.369	
MCV	M	340	89.222	9.2032	.000
	F	158	85.467	10.8751	
MCH	M	340	29.314	3.4358	.002
	F	158	27.821	5.6472	
MCHC	M	340	32.731	1.2867	.000
	F	158	31.710	1.6736	
Platelet	M	340	212.418	173.7922	.021
	F	158	240.679	96.6184	
RDW	M	339	14.85	2.001	.017
	F	158	16.03	8.606	
MPV	M	324	10.69	1.546	.712
	F	149	10.64	1.710	
PCT	M	229	.23	.078	.039
	F	111	.32	.645	
N	M	338	70.17	14.965	.013
	F	158	66.44	15.769	
L	M	338	22.32	12.779	.002
	F	158	26.45	14.309	
M	M	338	6.36	3.404	.088
	F	158	5.82	3.248	
E	M	338	.77	1.324	.058
	F	158	1.02	1.452	
B	M	338	.34	.277	.426
	F	158	.36	.244	
NLR	M	338	6.249	8.0469	.014
	F	158	5.138	7.238	
D-dimer	M	25	509.240	976.6293	0.468
	F	15	273.533	145.4706	
PDW	M	229	13.78	3.423	0.135
	F	112	13.36	3.772	

The above table illustrates the comparison of mean difference between the socio-demographic profile, laboratory parameters and the gender. It is found that there statistically significant (p -value <0.05) mean difference between RBC, Hb level, Hematocrit, MCV, MCH, MCHC, Platelet, RDW, PCT and NL ratio while Age, WBC, MPV, M, E, B, D-dimer and PDW were found to be statistically insignificant (p -value >0.05) with respect to gender.

DISCUSSION

The data has been taken from Mahatma Gandhi Hospital Jaipur in the year 2020. It is designed to analyse significance of lab parameter among corona patients.

CBC, D- dimer, IL-6, LDH and Ferritin were analysed and found associated with adverse outcomes. There is significant association of age, gender, comorbidity.

The corona virus disease 2019(COVID-19) pandemic, due to the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has caused a world-wide sudden and substantial increase in hospitalizations for pneumonia with multi organ disease. [10]

SARS-CoV-2 is spread primarily via respiratory droplets during close face-to-face contact. Infection can be spread by asymptomatic, presymptomatic, and symptomatic carriers. The average time from exposure to symptom on set is 5days, and 97.5 of people who develop symptoms do so within 11.5days. [10]

The SARS-CoV-2 infection enters the host cells through the S spike protein by binding to ACE2 for internalization and aided by TMPRSS2 protease. The high infectivity of the virus is related to mutations in the receptor binding domain and acquisition of a furan cleavage site in the S spike protein. The virus interaction with ACE2 may down regulate the anti-inflammatory function and heighten angiotensin II effects in predisposed patients. [11]

The symptoms are usually fever, cough, sore throat, breathlessness, fatigue, malaise among others. The disease is mild in most people; in some (usually the elderly and those with comorbidities), it may progress to pneumonia, acute respiratory distress syndrome (ARDS) and multi organ dysfunction. Many people are asymptomatic. The case fatality rate is estimated to range from 2 to 3%. [12]

Severe COVID-19 infection is the consequence of the overlapping effects of macrophage activation with uncontrolled inflammation, a complement-mediated endothelialitis and a thrombotic microangiopathy with platelet activation and high circulating serotonin. In addition, mast cell activation, auto-antibodies, and an imbalanced RAAS contribute to the pathogenesis of severe COVID-19 disease. [13]

Blood tests such as a normal or decreased white blood cell count (and lymphopenia) can be observed in many cases, which is also considered to be indicative of a worse prognosis. Increased levels of lactate dehydrogenase, C reactive protein, creatine kinase (CK MB and CK MM), aspartate aminotransferase and alanine amino-transferase can be seen. Increased D-dimer levels and an elevated neutrophil-to lymphocyte ratio are seen in some patients. Coagulation abnormalities can be observed in severe cases, as indicated by increase in prothrombin time and international normalised ratio. [14]

The second wave of COVID-19 in India was slightly different in presentation than the first wave, with a younger demography, lesser comorbidities, and presentation with breathlessness in greater frequency. [1]

The distribution of age as per different groups i.e.IL-6, LDH and Ferritin. It is found that mean age of study subjects was 47.53 ± 15.58 in IL-6 followed by 46.59 ± 17.35 in LDH and 47.28 ± 17.01 in Ferritin. The maximum age was found in the IL-6 group. A.J. Rodriguez-Morales et al studies have reported a mean age of 51.97 years. [15]

It is found that there is statistically significant (p -value <0.05) mean difference within the lab parameters (IL-6, Ferritin and LDH) in Covid patients using the Post Hoc Analysis. According to Ruan et al., IL-6 and serum ferritin level in discharged patients suggest that

uncontrolled systemic inflammation can be considered one of the major causes of disease severity in SARS-CoV-2 infection.[16] Coomes et al. reported that the mean IL-6 concentrations were 2.9-fold higher in patients with complicated COVID-19 compared to those with non-complicated disease [17]. In a study by Zhou et al., IL-6 and serum ferritin levels were elevated in non-survivors compared to survivors throughout the clinical course and increased with illness deterioration [18].

In our study, The comparison of mean difference between the socio-demographic profile, laboratory parameters and the gender. It is found that there statistically significant (p -value <0.05) mean difference between RBC, Hb level, Hematocrit, MCV, MCH, MCHC, Platelet, RDW, PCT and NL ratio while Age, WBC, MPV, M, E, B, D-dimer and PDW were found to be statistically insignificant (p -value >0.05) with respect to gender. As stated by Y. Mao et al. COVID-19 positive patients frequently exhibit hematologic abnormalities in the form of lymphopenia, leukopenia, and thrombocytopenia, along with elevated levels of liver enzymes, lactate dehydrogenase, prothrombin time and D-dimers [19]. According to J.F. Chan et al. Lymphopenia is associated with disease severity and mortality [20].

CONCLUSION

- SARS CoV-2 is highly infective and its control depends on strict implementation of preventive measures.
- The large variations in the clinical features of the disease, spanning from asymptomatic to fatal, necessitates the identification and application of novel laboratory biomarkers to rapidly and economically predict COVID-19 prognosis.
- The majority of recovered cases had the asymptomatic or mild disease at admission.
- The presence of moderate or severe disease at admission was associated with higher mortality.
- Comorbidities, particularly diabetes mellitus is associated with a higher mortality rate.
- High NLR at admission associated with a higher mortality.
- Laboratory features (e.g.,IL-6, LDH, Ferritin D-dimer etc.) were associated with poor outcomes
- The subsequent wave of COVID-19 in india was different in presentation than the first wave, with a younger demography and lesser comorbidities.

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