Original Article

Correlation Between Laboratory Findings and Clinical Severity among the COVID-19 Patients in the Tertiary Care Centre

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Background : Coronavirus is a highly infectious novel virus we are in urge to know more about their clinical characteristics and laboratory findings for the characterization and selection of treatment protocol.

Methods : Prospective, single centre study. Two months data was collected, clinical characteristics data from patient case sheet and the laboratoryvalues from the Hospital Information System (HIS) for the month of July and August 2020.

Results : Of 462 patients, 55 (11.9%) are falls under *asymptomatic* category, 194 (42%) are in *mild* category, 167 (36.1%) are in *moderate* category and 46 (10%) in *severe* category. Fever 230 (49.8%) and cough 211 (45.7%) was most common clinical symptom with *p* value < 0.01. Non-severe vs severe, 340 (73.6%) and 201 (43.5%) showed decreased in eosinophil count and absolute eosinophil count, 125 (27.1%) and 80 (17.3%) patient showed decrease in lymphocyte count and absolute lymphocyte count, 200 (43.3%) showed increase in neutrophil count with a significance of *p* value >0.05. 186 (40.3%) patients had one or more co-morbidities. Laboratory findings between Asymptomatic VS symptomatic, showed significance changes in neutrophil, lymphocyte, Aspartate aminotransferase, Alkaline phosphatase, globulin values (*p* value <0.05).

Conclusion : Clinical severity categorization at the time of admission was very helpful for the treating doctors in proper understanding of disease progression and appropriate treatment of the patient. Presence of co-morbidity, abnormal laboratory values, old age group patients, higher Computed Tomography score, higher mortality rate are seen more in patients who were in clinical severity grade *severe* category than in non-severe category patients.

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Key words : COVID-19, Laboratory findings, Clinical severity, Mortality, Computed Tomography.

Currently, the World is in the stage of childhood in understanding of novel coronavirus (COVID-19) in this prevailing pandemic situation. Since the signs and symptoms of this novel virus was non-specific[1] and similar to other viral infections, it is important to correlate the laboratory values with the clinical features of the Coronavirus infected patients for better understanding of the disease progression.Although COVID-19 has various clinical manifestations, most patients had no symptoms or mild symptoms, especially in the early disease stage[2]. The average incubation period of COVID-19, extending from exposure to onset of disease symptoms is estimated at approximately 5.2 days[3]. Laboratory medicine

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Editor's Comment :
- Proper categorisation based on clinical severity at the time admission along with basic laboratory tests plays vital role in the patient management.

plays an essential role in diagnosing and managing this COVID-19 even in the early stage of infection[4]. Various studies published the reports of Complete Blood Count (CBC) in COVID-19 patients with contradictory results as leukopenia, leukocytosis, and lymphopenia[5,6], which can influence the outcomes of COVID-19 patients So on correlating clinical features and basic laboratory investigation of COVID-19 cases in this study will be helpful for doctors to understand the changes happening in different clinical severity and also helps in diagnosis, categorization and appropriate treatment protocol of the patient by adding more novel information with the previous existing data.

MATERIAL AND METHODS

It was a prospective descriptive study conducted at Melmaruvathur Adhiparasakthi Institute of Medical Sciences and Research, Melmaruvathur. The data was collected from the patients, for whom COVID-19 infection was confirmed by PCR test and admitted in our institutional COVID-19 wing in the months of July

and August, 2020 and the patient data was collected after obtaining the approval from our institutional Ethical Committee. Patients clinical data was collected from case sheets and the laboratory data are extracted from the HIS. No specific interventions are utilized to conduct the study. Both clinical and laboratory data are entered in an enrolled patient's data collection sheet and entered in the SPSS software for statistical analysis. Patients were categorized into non-severe (asymptomatic, mild, moderate) and severe group at the time admission based on clinical severity guidelines prepared in our institution based on National Guidelines (ICMR & MoH&FW/DGHS, Clinical Management Protocol: COVID-19, version 4, 27.06.2020)[7]. Another correlation was done between Asymptomatic and Symptomatic (mild, moderate, severe) groups. Informed consent was obtained from the patient or from their relatives for using their clinical and laboratory data for research purpose.

All statistical analysis was performed using SPSS statistical software version 21.0, IBM. The categorical variables were described as frequency and percentages and the continuous variables were described using Mean, Median and Interquartile Range (IQR). Normally distributed data were analysed by independent sample t test; for non-parametric values the Mann-Whitney U test was used. The P values <0.05 were considered as statistically significant.

OBSERVATIONS

Totally 462 patients were enrolled, among which 279 (60.4%) were males and 183 (39.6%) were females. Among study participants, 30 (6.5%), 143 (31%), 198 (42.8%) and 91 (19.7%) patients were aged <18 years, 18 to 40 years, 41 to 60 years, > 60 years, respectively (Median Age 46, IQR 35-58).

The clinical presentation and clinical parameters analyzed in our study were noticed on the day of admission only. The most common clinical symptoms were fever in 230 (49.8%), cough in 211 (45.7%), dyspnea in 121 (26.2%), sore throat in 70 (15.2%) and body pain in 54 (11.7%) which was statistically significant with p value <0.01. Out of 462 patients, 186 (40.3%) had one or more co-morbidities. Most common was diabetes mellitus 141 (30.5%) and hypertension 79 (17.1%). Of 462 patients, 55 (11.9%) are falls under asymptomatic category, 194 (42%) are in mild category, 167 (36.1%) are in moderate category and 46 (10%) in severe category (Table 1).

Laboratory parameters and their significance of non-severe *versus* severe groups and Asymptomatic *versus* symptomatic refer (Tables 2&3). Laboratory parameters and their significance between among 55

asymptomatic individuals, only 4 (7.8%) belongs to >60 years of age and majority 38 (70%) individual in this group are belongs to <40 years. Duration of hospital stay was also less ie, 23 (42%) had discharged within 1 to 7 days of admission and importantly no one in this group had any co-morbidity.

Computed Tomography (CT) imaging studies has been done for 219 (47.4%) patients, among which 113 (51.6%) revealed CT severity score between 1 to 12, 57 (26%) revealed CT severity score between 13 to 19 and 49 (22.4%) revealed CT severity score ≥20 (scoring was done based on study by Yang R, *et al*[8]. Of 49 patients in severe CT score, majority ie, 43 are in severe category shows, greater the CT score greater the clinical severity and lower CT score patients are more seen in mild clinical severity category.

In 398 patients had mild oxygen saturation drop ie, SpO2 ≤94, 31 (6.7%) had SpO2 between 90-93% and 33 (7.1%) had SpO2 drop ≤89%.

Considering respiratory rate, it was significantly affected (p value <0.01), 118 (25.5%) patients had mildly increased rate (19 to 23 beats /min), 228 (49.4%) had moderately increased rate (24 to 30 beats /min) and 78 (16.9%) had rate >30 beats/min. Heart rate and Blood Pressure showed no significant changes.

Majority, 346 (74.9%) patients stayed in Hospital for 8 to 14 days, 92 (20%) patient stayed 1 to 7 days, 22 (4.7%) stayed 15 to 22 days and 2 (0.4%) stayed 22 to 28 days. Median duration of stay 10 days, IQR 3. 22 (4.7%) patients required ICU admission in our study population at the time of admission.

DISCUSSION

In our study, Male patient was 279 (60.4%) and female was 183 (39.6%) though there was slight male predominance there was no significant difference in clinical severity between gender. Similar findings were seen in a study by Wang D, *et al* gender was not a risk factor for the disease severity[9].

The most common clinical presentation and clinical parameters noticed in our study was fever [230 (49.8%)], cough [211 (45.7%)] and dyspnea [121 (26.2%)]. Similarly, in a study by Junli Li, *et al*, found fever [29 (78%)], dry cough [28 (76%)] and dyspnea [9 (57%)] was most common clinical presentation[10] but in another study by Mohan A, *et al,* found cough [31 (34.7%)] was most common followed by fever [25 (17.4%)] and nasal symptoms [31 (21.5%)][11].

Out of 462 patients, 55 (11.9%) are falls under asymptomatic category, 194 (42%) are under mild category, 167 (36.1%) are under moderate category and 46 (10%) under severe category. Mohan A, *et al* in his analyzes reported among 144 patients, 140 (97.2%)

Table 1 — *Tuberculosis has to come along with Comorbidities Section*					
Clinical Parameters	All Patients Total No (%)	'*p*' value	**Clinical Parameters**	All Patients Total No (%)	'*p*' value
Demographic Characteristics :			**Clinical Severity :**		
Age (years)			Asymptomatic	55 (11.9)	
< 18	30 (6.5)		Mild	194 (42)	
18 – 40	143 (31)		Moderate	167 (36.1)	
41 – 60	198 (42.3)	0.000	Severe	46 (10)	
> 60	91 (19.7)		**Vitals**		
Gender :			**Systolic Blood Pressure :**		
Male	279 (60.4)		Normal	152 (32.9)	
Female	183 (39.6)		Mild	302 (66)	0.001
Signs & Symptoms :			Severe	5 (1.1)	
Fever	230 (49.8)	0.000	**Heart Rate :**		
Cough	211 (45.7)	0.000	Normal	441 (95.5)	0.085
Sore Throat	70 (15.2)	0.001	High	21 (4.5)	
Dyspnea	121 (26.2)	0.000	**Respiratory Rate (per minute) :**		
Body Pain	54 (11.7)	0.004	Normal	38 (8.2)	
Diarrhea	20 (4.3)	0.085	Mild	118 (25.5)	0.000
Expectoration	32 (6.9)	0.031	Moderate	228 (49.4)	
Headache	16 (3.5)	0.135	Severe	78 (16.9)	
Loss of Taste	28 (6.1)	0.045	**SpO2 :**		
Loss of Smell	12 (2.6)	0.699	Mild	398 (86.1)	
Tremor	1 (0.2)	0.713	Moderate	31 (6.7)	0.002
Comorbidities : No of cases = 186 (40.3%)			Severe	33 (7.1)	
Diabetes Mellitus (DM)	81 (17.5)		**Temperature :**		
Hypertension (HTN)	24 (5.2)		Normal	432 (93.5)	0.038
DM + HTN	43 (9.3)		High	30 (6.5)	
Cardiac Diseases	2 (0.4)		**Cause of Death: Total = 14 (3%) cases :**		
DM + Cardiac Diseases	7 (1.5)		COVID Pneumonia	14	
DM + HTN + Cardiac Diseases	8 (1.7)		Kidney Diseases	12	
Cancer	2 (0.4)		Diabetes Mellitus	11	
HTN + Cardiac Diseases	3 (0.6)	0.012	Systemic Hypertension	4	
Thyroid Diseases	7 (1.5)		Cardiac Diseases	3	
Bronchial Asthma	4 (0.9)		Sepsis	2	
Seizure Disorders	1 (0.2)		Bronchial Asthma	1	
Hypercholesterolemia	1 (0.2)				
DM + HTN + CKD	1 (0.2)				
DM + Cardiac Diseases + CKD	1 (0.2)				
Tuberculosis	1 (0.2)				

falls in mild to moderate disease and remaining 4 (2.8%) falls under severe category[11]. Similarly, in another research by SakikoTabata, *et al* reported total of 104 patients, 43 are classified asymptomatic, 41 (39%) had mild COVID-19 and 20 (19%) had severe COVID-19[12].

SakikoTabata, *et al* noticed that the patients in the severe group are mostly older than those in the mild group[12]. In our survey also we had 92 (19.9%) patients with the age >60 years, of which 47 (51.1%) falls in moderate and 16 (17.3%) patients fall in severe group at the time of admission. Remaining, 25 (27%) patients falls in mild group and only 4 (4.3%) of patients falls in asymptomatic group. So it shows that patient who ages > 60 years are mostly had symptoms and they mostly fall in moderate and severe group (Fig 1). Interestingly, in another study by Soysal A, *et al* conducted in Turkey on children's found that the rate of symptomatic cases increases with age increases (p=0.049) ie, <11% in children <1 year, 19% in children

<5 years and 36% in children >5 years[13].

From our investigation non-severe VSsevere,340 (73.6%) and 201 (43.5%) patients showed decrease in eosinophil count and absolute eosinophil count. similarly, in a study by Hu Yun, *et al* reported, 21 (66%) and 24 (75%) patients had decrease in eosinophil count and their proportions and explained this might be due to the early stage of infection so the decline of eosinophils is faster[14]. Likewise, our study participants might have got admitted at the early stage of disease since the majority had eosinophils counts at the lower side.

In our study we have found, there was decreased lymphocyte count in 125 (27.1%) and absolute lymphocyte count in 80 (17.3%) and decreased albumin level in 90 (19.5%). Similarly, in a study by Hu Yun, *et al*, found that among 32 patients with COVID-19, 15 (47%) and 16 (50%) patients showed decreased lymphocyte count and lymphocyte ratio, 21 (66%) and contrastly increased albumin level[14].

Table 2 — *Clinical Severity has to be made separate Section and mild & moderate has to be made separate points*

Lab Parameters	Total Patients	No symptoms	Mild Group	Moderate Group	Severe Group	'P' value
Hemoglobin						
Normal	333 (72.1%)	37 (8%)	136 (29.4%)	122 (26.4%)	38 (8.2%)	0.056
Decreased	115 (24%)	18 (3.9%)	51 (11%)	40 (8.7%)	6 (1.3%)	
Increased	14 (3%)	0	8 (1.7%)	5 (1.1%)	1 (0.2%)	
RBC						
Normal	397 (85.9%)	50 (10.8%)	173 (37.4%)	134 (29%)	40 (8.7%)	0.539
Decreased	62 (13.4%)	5 (1.1%)	21 (4.5%)	31 (6.7%)	5 (1.1%)	
Increased	3 (0.6%)	0	1 (0.2%)	2 (0.4%)	0	
WBC						
Normal	381 (82.5%)	50 (10.8%)	163 (35.3%)	137 (29.7%)	31 (6.7%)	0.004
Decreased	46 (10%)	3 (0.6%)	17 (3.7%)	23 (5%)	3 (0.6%)	
Increased	35 (7.6%)	2 (0.4%)	15 (3.2%)	7 (1.5%)	11 (2.4%)	
Neutrophil						
Normal	248 (53.7%)	38 (8.2%)	124 (26.8%)	80 (17.3%)	6 (3%)	0.000
Decreased	14 (3%)	5 (1.1%)	7 (1.5%)	2 (0.4%)	0	
Increased	200 (43.3%)	12 (2.6%)	64 (13.9%)	85 (18.4%)	39 (8.4%)	
Lymphocyte						
Normal	268 (58%)	27 (5.8%)	125 (27.1%)	105 (22.7%)	11 (2.4%)	0.001
Decreased	125 (27.1%)	9 (1.9%)	34 (7.4%)	49 (10.6%)	33 (7.1%)	
Increased	69 (14.9%)	19 (4.1%)	36 (7.8%)	13 (2.8%)	1 (0.2%)	
Eosinophil						
Normal	113 (24.5%)	21 (4.5%)	54 (11.7%)	34 (7.4%)	4 (0.9%)	0.028
Decreased	340 (73.6%)	30 (6.5%)	139 (30.1%)	130 (28.1%)	41 (8.9%)	
Increased	9 (1.9%)	4 (0.9%)	2 (0.4%)	3 (0.6%)	0	
Monocyte						
Normal	429 (92.9%)	51 (11%)	185 (40%)	158 (34.2%)	35 (7.6%)	0.000
Decreased	31 (6.7%)	4 (0.9%)	9 (1.9%)	8 (1.7%)	10 (2.2%)	
Increased	2 (0.4%)	0	1 (0.2%)	1 (0.2)	0	
Platelets						
Normal	406 (87.9%)	54 (11.7%)	175 (37.9%)	141 (30.5%)	36 (7.8%)	1.00
Decreased	42 (9.1%)	0	14 (3%)	22 (4.8%)	6 (1.3%)	
Increased	14 (3%)	1 (0.2%)	6 (1.3%)	4 (0.9%)	3 (0.6%)	
ANC						
Normal	380 (82.3%)	48 (10.4%)	167 (36.1%)	137 (29.7%)	28 (6.1%)	0.000
Decreased	22 (4.8%)	3 (0.6%)	9 (1.9%)	8 (1.7%)	2 (0.4%)	
Increased	60 (13%)	4 (0.9%)	19 (4.1%)	22 (4.8%)	15 (3.2%)	
ALC						
Normal	341 (73.8%)	40 (8.7%)	152 (32.9%)	122 (26.4%)	27 (5.8%)	0.103
Decreased	80 (17.3%)	3 (0.6%)	21 (4.5%)	38 (8.2%)	18 (3.9%)	
Increased	41 (8.9%)	12 (2.6%)	22 (4.8%)	7 (1.5%)	0	
AMC						
Normal	377 (81.6%)	49 (10.6%)	173 (37.4%)	127 (27.5%)	28 (6.1%)	0.000
Decreased	83 (18%)	6 (1.3%)	22 (4.8%)	38 (8.2%)	17 (3.7%)	
Increased	2 (0.4%)	0	0	2 (0.4%)	0	
AEC						
Normal	261 (56.5%)	45 (9.7%)	132 (28.6%)	74 (16%)	10 (2.2%)	0.000
Decreased	201 (43.5)	10 (2.2)	63 (13.6)	93 (20.1%)	35 (7.6%)	
D-Dimer						
Negative	263 (92%)	12 (4.2%)	113 (39.5%)	104 (36.4%)	34 (11.9%)	0.238
Positive	23 (8%)	1 (0.3%)	4 (1.4%)	13 (4.5%)	5 (1.7%)	
AST						
Normal	347 (75.1%)	50 (10.8%)	159 (34.4%)	117 (25.3%)	21 (4.5%)	0.000
Increased	115 (24.9%)	5 (1.1%)	36 (7.8%)	50 (10.8%)	24 (5.2%)	
ALT						
Normal	367 (79.4%)	52 (11.3%)	161 (34.8%)	126 (27.3%)	28 (6.1%)	0.003
Increased	95 (20.6%)	3 (0.6%)	34 (7.4%)	41 (8.9%)	17 (3.7%)	

Tot Bilirubin						
Normal	442 (95.7%)	54 (11.7%)	190 (41.1%)	158 (34.2%)	40 (8.7%)	0.019
Increased	20 (4.3%)	1 (0.2%)	5 (1.1%)	9 (1.9%)	5 (1.1%)	
DR Bilirubin						
Normal	204 (44.2%)	29 (6.3%)	94 (20.3%)	68 (14.7%)	13 (2.8%)	0.031
Increased	258 (55.8%)	26 (5.6%)	101 (21.8%)	99 (21.4%)	32 (6.9%)	
ID Bilirubin						
Normal	454 (98.3%)	55 (11.9%)	191 (41.3%)	164 (35.5%)	44 (9.5%)	0.791
Increased	8 (1.7%)	0	4 (0.9%)	3 (0.6%)	1 (0.2%)	
Tot Protein						
Normal	442 (95.7%)	53 (11.5%)	194 (42%)	160 (34.6%)	35 (7.6%)	0.000
Decreased	18 (3.9%)	0	1 (0.2%)	7 (1.5%)	10 (2.2%)	
Increased	2 (0.4%)	2 (0.2%)	0	0	0	
Albumin						
Normal	361 (78.1%)	51 (11%)	172 (37.2%)	122 (26.4%)	16 (3.5%)	0.000
Decreased	90 (19.5%)	1 (0.2%)	16 (3.5%)	44 (9.5%)	29 (6.3%)	
Increased	11 (2.4%)	3 (0.6%)	7 (1.5%)	1 (0.2%)	0	
Globulin						
Normal	394 (85.3%)	38 (8.2%)	171 (37%)	141 (30.5%)	44 (9.5%)	0.014
Decreased	35 (7.6%)	11 (2.4%)	13 (2.8%)	11 (2.4%)	0	
Increased	33 (7.1%)	6 (1.3%)	11 (2.4%)	15 (3.2%)	1 (0.2%)	
AG Ratio						
Normal	236 (60%)	31 (6.7%)	118 (25.5%)	77 (16.7%)	10 (2.2%)	0.001
Decreased	200 (43.4%)	15 (3.3%)	63 (13.6%)	87 (18.8%)	35 (7.6%)	
Increased	26 (5.6%)	9 (2%)	14 (3%)	3 (0.6%)	0	
LDH						
Normal	41 (22.7%)	5 (2.8%)	17 (9.4%)	17 (9.4%)	2 (1.1%)	0.034
Increased	140 (77.3%)	6 (3.3%)	63 (34.8%)	49 (27.1%)	22 (12.3%)	
Ferritin						
Normal	111 (38.1%)	12 (4.1%)	63 (21.6%)	33 (11.3%)	3 (1%)	0.000
Decreased	24 (8.2%)	3 (1%)	17 (5.8%)	3 (1%)	1 (0.3%)	
Increased	156 (53.6%)	2 (0.7%)	54 (18.6%)	69 (23.7%)	31 (10.7%)	
Urea						
Normal	424 (91.8%)	54 (11.7%)	184 (39.8%)	149 (32.3%)	37 (8%)	0.013
Decreased	2 (0.4%)	0	2 (0.4%)	0	0	
Increased	36 (7.8%)	1 (0.2%)	9 (1.9%)	18 (3.9%)	8 (1.7%)	
Creatinine						
Normal	432 (93.5%)	54 (11.7%)	190 (41.1%)	146 (31.6%)	42 (9.1%)	0.960
Increased	30 (6.5%)	1 (0.2%)	5 (1.1%)	21 (4.5%)	3 (0.6%)	
CPR						
Negative	242 (81.2%)	16 (5.4%)	117 (39.3%)	80 (26.8%)	29 (9.7%)	0.940
Positive	56 (18.8%)	0	13 (4.4%)	36 (12.1%)	7 (2.3%)	

Weiliang Cao, *et al* also reported that Lymphocytes counts are significantly (P < 0.01) lower in severe group than non-severe groups[15].

We also observed that decreased Haemoglobin in 115 (24%) and Red Blood Cells (RBC) in 62 (13.4%) Similarly, Xuemei Liu, *et al* figured out there was decrease in Haemoglobin in 40% and RBC in 39%[16].

Further we noticed, Liver function test values are significantly elevated, AST in 115 (24.9%), ALT in 95 (20.6%), Direct Bilirubin in 258 (55.8%), LDH in 140 (77.3%) and C-reactive Protein (CRP) is increased in 56 (12.1%). Total Bilirubin and Indirect Bilirubin are not affected. Similarly, SakikoTabata, *et al,* in their study noticed that there was increased AST in 4 (9%), ALTin 5 (12%) and LDH in 9 (21%)[12]. Weiliang Cao, *et al* published that CRP, ALT and AST levels are increased significantly (P<0.01) in severe group patients[15].

On comparing Laboratory parameters of asymptomatic *versus* symptomatic, neutrophils, lymphocytes, AST, ALT, ferritin are increased significantly (p<0.01) and albumin are decreased significantly (p<0.01)in symptomatic patients. CRP was increased in all symptomatic patients and it was negative in all asymptomatic patients. LDH increased in most of the patients**.** Supporting our findings, Li Y, *et al* published the symptomatic patients had a significantly higher Lymphocyte count than asymptomatic patients (P = 0.03)[17]. In Contrast, studies in children's showed decreased Lymphocytes and LDH was raised[13]. Leucocyte, eosinophil, monocyte, Aspartate Aminotransferase (AST), total bilirubin, total protein, albumin, ferritin counts are affected significantly in symptomatic individuals. But these were significantly affected in severe groups (p value <0.05). Among Asymptomatics, 19 (4.1%) and 28 (5.6%) showed increase in Lymphocyte count and direct bilirubin level, 30 (6.5%) showed decreased count which was minimal number and not statistically significant.

In our survey, out of 462 patients, 186 (40.3%) had one or more co-morbidities. In which the most common

Table 3 — *Comparison of Laboratory Findings Between Asymptomatic and Symptomatic Groups*

Lab Parameters	Total Patients	No Symptomatic	Symptomatic	P 'value'
Hemoglobin				
Normal	333 (72.1%)	37 (8%)	296 (64.1%)	0.504
Decreased	115 (24%)	18 (3.9%)	97 (21%)	
Increased	14 (3%)	0	14 (3%)	
RBC				
Normal	397 (85.9%)	50 (10.8%)	347 (75.1%)	0.253
Decreased	62 (13.4%)	5 (1.1%)	57 (12.3%)	
Increased	3 (0.6%)	0	3 (0.6%)	
WBC				
Normal	381 (82.5%)	50 (10.8%)	331 (71.6%)	0.079
Decreased	46 (10%)	3 (0.6%)	43 (9.3%)	
Increased	35 (7.6%)	2 (0.4%)	33 (7.1%)	
Neutrophil				
Normal	248 (53.7%)	38 (8.2%)	210 (45.5%)	0.003
Decreased	14 (3%)	5 (1.1%)	9 (1.9%)	
Increased	200 (43.3%)	12 (2.6%)	188 (40.7%)	
Lymphocyte				
Normal	268 (58%)	27 (5.8%)	241 (52.2%)	0.014
Decreased	125 (27.1%)	9 (1.9%)	116 (25.1%)	
Increased	69 (14.9%)	19 (4.1%)	50 (10.8%)	
Eosinophil				
Normal	113 (24.5%)	21 (4.5%)	92 (19.9%)	0.092
Decreased	340 (73.6%)	30 (6.5%)	310 (67.1%)	
Increased	9 (1.9%)	4 (0.9%)	5 (1.1%)	
Monocyte				
Normal	429 (92.9%)	51 (11%)	378 (81.8%)	0.976
Decreased	31 (6.7%)	4 (0.9%)	27 (5.8%)	
Increased	2 (0.4%)	0	2 (0.4%)	
Platelets				
Normal	406 (87.9%)	54 (11.7%)	352 (76.2%)	0.014
Decreased	42 (9.1%)	0	42 (9.1%)	
Increased	14 (3%)	1 (0.2%)	13 (2.8%)	
ANC				
Normal	380 (82.3%)	48 (10.4%)	332 (71.9%)	0.268
Decreased	22 (4.8%)	3 (0.6%)	19 (4.1%)	
Increased	60 (13%)	4 (0.9%)	56 (12.1%)	
ALC				
Normal	341 (73.8%)	40 (8.7%)	301 (65.2%)	0.268
Decreased	80 (17.3%)	3 (0.6%)	77 (16.7%)	
Increased	41 (8.9%)	12 (2.6%)	29 (6.3%)	
AMC				
Normal	377 (81.6%)	49 (10.6%)	328 (71%)	0.125
Decreased	83 (18%)	6 (1.3%)	77 (16.7%)	
Increased	2 (0.4%)	0	2 (0.4%)	
AEC				
Normal	261 (56.5%)	45 (9.7%)	216 (46.8%)	0.000
Decreased	201 (43.5)	10 (2.2)	191 (41.3%)	
D-Dimer				
Negative	263 (92%)	12 (4.2%)	251 (87.8%)	0.962
Positive	23 (8%)	1 (0.3%)	22 (7.7%)	
AST				
Normal	347 (75.1%)	50 (10.8%)	297 (64.3%)	0.004
Increased	115 (24.9%)	5 (1.1%)	110 (23.8%)	

Lab Parameters	Total Patients	No Symptomatic	Symptomatic	P 'value'
ALT				
Normal	367 (79.4%)	52 (11.3%)	315 (68.2%)	0.003
Increased	95 (20.6%)	3 (0.6%)	92 (19.9%)	
Tot Bilirubin				
Normal	442 (95.7%)	54 (11.7%)	388 (84%)	0.330
Increased	20 (4.3%)	1 (0.2%)	19 (4.1%)	
DR Bilirubin				
Normal	204 (44.2%)	29 (6.3%)	175 (37.9%)	0.174
Increased	258 (55.8%)	26 (5.6%)	232 (50.2%)	
ID Bilirubin				
Normal	454 (98.3%)	55 (11.9%)	399 (86.4%)	0.295
Increased	8 (1.7%)	0	8 (1.7%)	
Tot Protein				
Normal	442 (95.7%)	53 (11.5%)	384 (84.2%)	0.831
Decreased	18 (3.9%)	0	18 (3.9%)	
Increased	2 (0.4%)	2 (0.2%)	0	
Albumin				
Normal	361 (78.1%)	51 (11%)	310 (67.1%)	0.010
Decreased	90 (19.5%)	1 (0.2%)	89 (19.3%)	
Increased	11 (2.4%)	3 (0.6%)	8 (1.7%)	
Globulin				
Normal	394 (85.3%)	38 (8.2%)	356 (77.1%)	0.001
Decreased	35 (7.6%)	11 (2.4%)	24 (5.2%)	
Increased	33 (7.1%)	6 (1.3%)	27 (5.8%)	
AG Ratio				
Normal	236 (60%)	31 (6.7%)	204 (44.2%)	0.883
Decreased	200 (43.4%)	15 (3.3%)	185 (40.1%)	
Increased	26 (5.6%)	9 (2%)	17 (3.6)	
LDH				
Normal	41 (22.7%)	5 (2.8%)	36 (19.9%)	0.062
Increased	140 (77.3%)	6 (3.3%)	134 (74%)	
Ferritin				
Normal	111 (38.1%)	12 (4.1%)	99 (34%)	0.001
Decreased	24 (8.2%)	3 (1%)	21 (7.2%)	
Increased	156 (53.6%)	2 (0.7%)	154 (52.9%)	
Urea				
Normal	424 (91.8%)	54 (11.7%)	370 (80.1%)	0.066
Decreased	2 (0.4%)	0	2 (0.4%)	
Increased	36 (7.8%)	1 (0.2%)	35 (7.6%)	
Creatinine				
Normal	432 (93.5%)	54 (11.7%)	378 (81.8%)	0.134
Increased	30 (6.5%)	1 (0.2%)	29 (6.3%)	
CPR				
Negative	242 (81.2%)	16 (5.4%)	226 (75.8%)	0.940
Positive	56 (18.8%)	0	56 (18.8%)	

was Diabetes Mellitus 141 (30.5%) and hypertension 79 (17.1%). Similarly, in a studies by Mammen JJ, *et al* also reported that diabetes 43.5% was most common co-morbidity[18] and Mohan, *et al* reported 23 (15.9%) out of 144 study participants had co-morbidity, in which 16 (11.1%) are diabetic was the common[11] and it was similar to other published studies[1,9,19].

Junli Li, *et al* published that, the patients in the death group are mostly older (p=0.002), had higher incidence of hypertension (p=0.045), coronary disease (p=0.002) and dyspnea (p=0.020) at the time of admission[11]. Mortality rate in our study was 14 (3%), of which 8 falls in severe group and 6 falls in moderate group. No death was reported in Mild and Asymptomatic group in our study. 5 out of 14 death patients had CT score of severe grade and 11 of them

had co-morbidities. In a study by Mohan A, *et al*, reported death rate of 1.4% ie, 2 of 144 patients and both were belonged to severe group[11].

Of 14 expired patients, 11 had co-morbidity and all 11 had Diabetes Mellitus has a co-morbidity along with other disease association (Table 1). Likewise, in study by, Acharya, *et al* published that, higher mortality was seen among the diabetes than non-diabetic patients (20% *versus* 4.8%) among COVID-19 patients[20], but in contrast Mammen JJ, *et al* noted that presence of diabetes was not significantly different between survivors and non-survivors (42.5% *versus* 49.2%, p=0.310)[18]. This shows that death rate was higher in a patient with co-morbidity especially Diabetes Mellitus.

Many studies concluded that older age, co-morbidity association, higher CT score, Lymphopenia

are major factors for risk factors for disease progression and morbidity in severe group with p<0.01[12,19] because of their poor immune response.

CONCLUSION

Clinical severity categorization along with laboratory findings guides treating physicians to decide specific treatment protocol for every single patient promptly. Another important finding from our study was patient who falls in severe category are aged >60 years, co-morbidity association and higher CT score than in asymptomatic, mild and moderate category (non-severe) patients. When comes to asymptomatic and symptomatic individuals, not much derangements seen in asymptomatic, this might be because of more number of younger age group and nil co-morbidity makes them asymptomatic. So from this point of view, patients with older age group and co-morbidity should be given extra care in their management.

Fig 1 — Age wise distribution of patients based on their clinical severity

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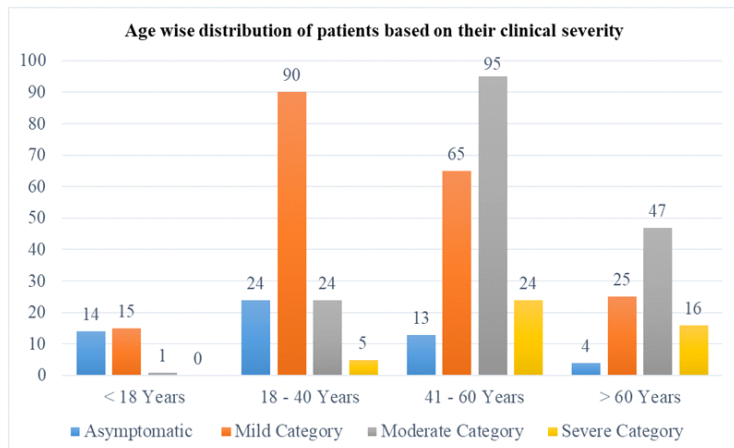
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