Clinical and Biochemical Profile of COVID-19 Patients Admitted in a Tertiary Care Hospital of Kolkata

AVICK NAG[1], SOUMYADEEP GHOSH[2], ANUSHREE PAL[3], ANKAN SAHA[4], SANJAY KUMAR MANDAL[5]

ABSTRACT

Introduction: The disease caused by Coronavirus (COVID-19), is now pandemic all over the world including India. There are different manifestations of the disease from asymptomatic and mild to severe form. Clinical severity varies from country to country. This study was conducted to document different clinical and biochemical profiles in this Tertiary Care Hospital of Kolkata.

Aim: The study was done to observe and to compare the clinical and biochemical profile in asymptomatic to mild and moderate to severe symptomatic patients.

Materials and Methods: This was an observational study conducted in Medical College, Kolkata, West Bengal, India. The study was conducted from June 2019 to mid-August 2019. Total 573 Real Time Polymerase Chain Reaction (RT PCR) positive COVID patients were included in this study. All patients were examined and investigated with blood parameters. Patients were divided into two groups (Group A-asymptomatic and mild symptoms and Group B moderate and severe symptoms) clinically. Statistical calculators like Statistical Package for Social Sciences (SPSS) and Soccalculator were used and different biochemical parameters were analysed using Chi-square, unpaired T-test to find out significance among these two groups.

Results: Among 573 patients, 222 were in group A and 351 were in group B. Fever was the most common presenting feature (69.6%) followed by dry cough and shortness of breath. Other features were malaise/fatigability, diarrhoea and anosmia. Among the co-morbidities hypertension and diabetes were significantly different between the two groups. Among the biochemical parameters Neutrophil-Lymphocyte Ratio (NLR), C-Reactive Protein (CPR), D-dimer, Prothrombin time, Serum Glutamic Oxaloacetic Transaminase (SGOT), Serum Glutamic Pyruvic Transaminase (SGPT) were significantly different between the two groups.

Conclusion: In a tertiary care hospital of Kolkata, fever is the most common presentation followed by dry cough and fatigability in COVID patients. Diabetes and hypertension are the common co morbidities. CRP, NLR, D-dimer, prothrombin time, SGOT and SGPT should be monitored to differentiate between mild and severe cases.

INTRODUCTION

In December 2019, a group of patients with pneumonia of unknown cause were detected in Wuhan, Hubei province, China, which was previously not seen in humans or animals. Subsequently, World Health Organisation (WHO) announced that the causative agent of the disease is SARS-CoV-2 or COVID-19 on 11 February, 2020 [1]. After that the disease spread in most of the countries of all the continents and turned into a pandemic. In India the disease is spreading rapidly from end of the March, 2020. Different clinical manifestations like fever, cough, sore throat, myalgia, asthenia, diarrhoea, loss of taste and smell sensation, respiratory distress have been documented [2]. But these manifestations vary from person to person. Though majority of patients are asymptomatic to mild symptomatic but some of them develop more severe symptoms like Acute Respiratory Distress Syndrome (ARDS) [3]. Severity of the disease depends on host immunity and associated comorbidities. But research is still going on whether severity of the disease depends on genotypes of the virus. Though scientists have strongly stated that only one strain of COVID-19 is causing the pandemic worldwide, researches are going on to determine the different genotypes. In this part of the world, mainly in eastern India genotyping is far from reality. So, variations in clinical and biochemical profile can give an idea which patient will develop more severe disease, so that early intervention can prevent progression to severe form [4].

The objective of the study was to observe and compare the clinical and biochemical profiles between the asymptomatic to mild symptomatic and moderate to severe group. In the present study,

the moderate and severe groups have been clubbed together, since most often the moderate patients have prolonged hospital stay or require long term therapy or even may progress to severe/critical stage. So the objective was to analyse the clinical and biochemical parameters and predict the severity at the earliest.

MATERIALS AND METHODS

This was a cross-sectional hospital based study. The study was done in Medical College, Kolkata, West Bengal, India, which is the oldest medical college in Asia. The Hospital has been turned into a tertiary center for COVID patients due to the pandemic situation. All newly diagnosed COVID-19 positive patients who were more than 12 years of age were selected from COVID indoor wards of the Hospital and included in this study. Pregnant patients and patients aged less than 12 years were excluded from the study. The study was approved by the Institutional Ethics Committee (Reference No of Ethical approval: MC/KOL/IEC/NON-SPON/715/06/2020 Date of Ethical Approval: 22/06/2020) of the hospital and informed consent was taken from all the subjects.

Total 573 patients (excluding pregnant patients and children) after being tested COVID positive by RT-PCR were admitted in COVID indoor wards. The study was conducted from June 2019 to mid-August 2019. All of these 573 patients were included in the study. A detailed history was taken and a careful clinical examination was performed. According to the Ministry of Health and Family Welfare (MoHFW) guidelines on Clinical Management of COVID-19 all the patients were investigated for routine blood examinations like

complete haemograms, Erythrocyte Sedimentation Rate (ESR), C-Reactive Protein (CRP), D-dimer, Liver Function Test (LFT), Sugar (Fasting and Post prandial), Urea, Creatinine and Chest X-ray [5]. High Resolution Computed Tomography (HRCT) chest and Echocardiography were performed. Chest X-ray, HRCT, Echocardiography were performed as and when necessary for the treatment purpose of the patients. As this study was based on clinical and biochemical parameters of the patients, the radiological parameters were not included in the results.

The population of the present study were classified into asymptomatic, mild, moderate and severe subgroups. Oxygen saturation (SpO$_2$ at room air) was the main criteria for categorising COVID-19 cases into mild (95%-100%)/moderate (90%-94%)/severe (<90%) [5]. But Authors had divided them into major two groups for statistical analysis. Group A (n=222) included asymptomatic and mild cases. Group B (n=351) included moderate and severe cases. Statistical analysis was done on these 573 patients.

STATISTICAL ANALYSIS

Statistical calculators like SPSS and Soccalculator were used and differences between different biochemical parameters were analysed using Chi-square, unpaired T-test to find out significance among these two groups. A p-value less than 0.05 was considered significant.

RESULTS

Total 573 patients were taken for final statistical analysis. Out of 573 patients 222 patients were in group A and 351 patients were in group B. Among these 573 patients, 441 (76.9%) patients were males and 132 (23.1%) patients were females. Analysing the demographic variables further, mean age of Group A was 43.04 years and Group B was 58.84 years. The most common presenting symptom was fever which was present in 69.6% of the study population followed by dry cough (53.4%) and shortness of breath (48.1%). Other atypical symptoms were anosmia (7.8%), diarrhoea (10.9%) and malaise/fatigability (30.3%). And 6.8% of the study subjects were asymptomatic throughout their stay [Table/Fig-1]. [Table/Fig-1] also shows the percentage of symptoms in Group A and B individually. At least 52% (n=300) of the study population had any one medical co-morbidity. Among these 40.3% had hypertension, 28.2% had diabetes mellitus, 10.4% had history of smoking (past or at present), 5.2% had COPD/Asthma, 9.94% had history of Chronic Kidney Disease (CKD), 5.7% was having immunosupression in the form of malignancy or HIV and 16.7% had history of ischaemic heart disease. Among the co-morbidities only hypertension and diabetes were found to be significantly associated with moderate/severe disease [Table/Fig-2]. Oxygen saturation (SpO$_2$ at room air) was our main criteria for categorising COVID-19 cases into mild/moderate/severe. Since "Happy Hypoxia" is a concerning factor in COVID-19 cases, we found that 21.37% was having happy hypoxia with SpO$_2$ <94% but not having any shortness of breath [6].

The biochemical parameters like ESR, NLR, CRP, blood albumin level, D-dimer, Prothrombin Time (PT), SGOT and SGPT were found

Variables	All patients N=573	Asymptomatic/ Mild (A) N=222	Moderate/ Severe (B) N=351	p-value
Age*		43.04 years	58.84 years	
Gender				
Male (%)	441 (76.9%)	168	273	0.7
Female (%)	132 (23.1%)	54	78	
Co-morbidity No. (%)				
Hypertension	231 (40.3%)	39 (17.56%)	192 (54.7%)	<0.001
Diabetes mellitus	162 (28.2%)	27 (12.16%)	135 (38.46%)	<0.001
COPD/Asthma	30 (5.2%)	12 (5.4%)	18 (5.12%)	0.884
CKD	57 (9.94%)	6 (3%)	12 (3.41%)	0.632
Malignancy/ Immunosupression	33 (5.7%)	0	33 (9.40%)	
CAD	96 (16.75%)	18 (8.1%)	78 (22.22%)	0.00001

[Table/Fig-2]: Associated co-morbidities of admitted patients.
*Mean age. CAD: Coronary artery disease; CKD: Chronic kidney disease; COPD: Chronic obstructive pulmonary disease. Chi-square test

to be significantly (p-value <0.05) different between the Group A and Group B patients. Platelet level and Creatinine values did not show any significant difference among asymptomatic/mild and moderate/severe group [Table/Fig-3], but when creatinine values were compared among the moderate and severe group of patients, they showed statistical significance.

Variables	Asymptomatic/ Mild N=222 Group A	Moderate/Severe N=351 Group B	p-value
Hb (g/dL)	12.82±1.99	11.76±2.13	0.0076
ESR (mm/hr)	20.54±7.8	34.03±11.69	<0.0001
MCV (fL)	85.21±9.57	86.84±8.51	0.26
MCH (pg)	28.59±7.20	28.32±6.36	0.84
NLR	3.82±3.22	8.73±5.72	<0.001
CRP (mg/dL)	11.65±15.65	54.93±31.83	<0.001
SGPT (U/L)	46.98±41.56	60.78±46.70	0.03
Blood albumin (gm/dL)	3.83±0.51	3.22±0.46	<0.001
D-dimer (mg/dL)	0.46±0.29	1.84±2.18	<0.001
Urea (mg/dL)	25.20±15.67	41.76±37.13	<0.004
Creatinine (mg/dL)	1.21±1.52	1.25±0.78	0.80
		Moderate- 0.97±0.23	<0.001
		Severe- 1.5±1.01	
Prothrombin time (sec)	12.8±1.85	14.31±2.37	<0.001
SGOT(U/L)	43.91±35.4	57.5±35.3	0.01
Platelets (/microlitre)	264013±106169	263205±124112	0.9

[Table/Fig-3]: Showing values of different Biochemical parameters among patients of the two groups.
Hb: Haemoglobin; ESR: Erythrocyte sedimentation rate; MCV: Mean corpuscular volume; MCH: Mean corpuscular haemoglobin; NLR: Neutrophil-lymphocyte ratio; Unpaired t-test; p-value <0.05 considered significant

DISCUSSION

The Novel COVID-19 belongs to the β-coronavirus cluster. As the third most highly pathogenic coronavirus, the clinical presentations of Novel COVID-19 infection resemble those of the other two coronaviruses: Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV) and Middle East Respiratory Syndrome Coronavirus (MERS-CoV) [7,8]. COVID-19 has created havoc across the globe. Till now 2,38,71,350 cases have been confirmed worldwide. Whereas, India has recorded about 31,91,997 cases with a death rate of approximately 2%. This virus may show geographical differences in its pathogenecity. Though genotyping has been started in different parts of the world, in this part of the India it is in a nascent stage [4]. Studying the clinical and biochemical profile in this cross-sectional study may give the idea of the clinico-demographic profile in this part

Symptoms*	Total (%) N=573	Group A n=222 (%)	Group B n=351 (%)
Fever	399 (69.6%)	99 (44.59%)	300 (85.47%)
Cough	306 (53.4%)	93 (41.89%)	213 (60.68%)
SOB	276 (48.1%)	0	276 (78.63%)
Anosmia	45 (7.8%)	27 (12.16%)	18 (5.12%)
Diarrhoea	63 (10.9%)	39 (17.56%)	24 (6.83%)
Malaise/Fatigability	174 (30.3%)	72 (32.43%)	102 (29.05%)
Asymptomatic	39 (6.8%)	39 (17.56%)	0

[Table/Fig-1]: Showing symptoms at the time of presentation.
*at the time of presentation. SOB: Shortness of breath

of the world. Unlike other studies, clubbing moderate and severe/critical patients in one group will help us to predict disease severity earlier in its course. This is done because we have encountered in our clinical practice that once patients in the moderate stage, often their hospital stay is prolonged or they end up in critical care units and hence the mortality increases. This is one of the uniqueness of our study.

Large proportion of the study population are moderate/severe patients (61.25%) and this is because Medical College being a dedicated COVID-19 Tertiary Care Hospital since 8th May 2020, handles majority of the severe cases of Bengal.

Older ages are affected more severely than the younger population. This may be due to the fact that older population suffers from one or more co-morbidities. But the present study also showed that a certain number of relatively young patients required mechanical ventilation (the significance of this finding needs further research).

The male predominance in the study may be due to the reason that males in this part of our country tend to go outside more for different purposes thus females are less affected than males.

Fever (69.6%) and cough (53.4%) were the most frequent symptoms encountered in the present study, similar to earlier studies [9]. A 44.59% of Group A and 85.47% of Group B patients had fever whereas 41.89% of Group A and 60.68% of Group B patients had cough in the present study. As expected, SOB was encountered with moderate/severe diseases. Other infrequent symptoms were malaise, anosmia, and diarrhoea. A 6.8% of all patients were asymptomatic. Asymptomatic patients are epidemiologically important because they can be super spreaders. Though different studies done throughout the world showed different prevalence of asymptomatic cases, our hospital being a tertiary care centre encountered large amount of symptomatic patients, and thus our study had a less number of asymptomatic patients [10,11].

Atleast 52% of the patients have one or more of the co-morbidities. Hypertension was a significant comorbidity [12]. Next was diabetes mellitus. These two, including ischemic heart disease, showed significance differences (p-value <0.05) with the severity of the disease. The cytokine storm is more likely to develop in patients with diabetes, as diabetes is already characterised by low-grade chronic inflammation. Moreover, in the case of high viral load, the capacity to raise an acute immune response might be compromised in patients with diabetes, exposing them to more severe adverse effects. Another study found a higher risk of a composite outcome (ICU admission, mechanical ventilation, and death) in patients with hyperglycaemia at admission (fasting blood glucose >7 mmol/L) and without history of diabetes compared to the patients without diabetes and normoglycaemia [13].

In accordance to the Liu J et al., and Wan S et al., study, this study also revealed increased NLR in the moderate/severe group which is an indirect indicator of lymphopenia [14,15]. CRP which is an acute phase protein, was significantly increased in group B (mainly with multi-organ damage and shock). Wang L in his study also showed a positive correlation between lung involvement and blood CRP levels [16]. Other blood parameters which were significantly abnormal in the Group B were SGOT, D-dimer, PT. COVID-19 causes cytokine storm which in turn causes vascular endothelial damage, activates the coagulation system, and inhibits the fibrinolytic and anticoagulating systems. Excessive thromboses in the microvascular system lead to Disseminated Intravascular Coagulation (DIC) and, ultimately, microcirculatory disorder and serious multiple organ dysfunction syndrome [17]. Therefore, early detection and correction of coagulation dysfunction could effectively reduce mortality. D-dimer indicates that there is a hypercoagulating state and secondary fibrinolysis in the body, which can be seen in increased fibrinolytic activity of the body system and PT can be used for early diagnosis of DIC [18]. This study showed significant elevation of PT and D-dimer in the moderate/severe group. Blood albumin levels showed substantial differences among different studies. Chen N et al., showed a reduction in albumin in 98% of patients with COVID-19 [9], whereas Wu J et al., showed that only 2% of patients had decreased ALB levels [19]. The present study showed decreased albumin among the progressive group (Group B). SGPT, creatinine, and Platelets did not show any significant difference between Group A and Group B. But creatinine values were significantly different among moderate and severe groups. This may be due to the fact that severe (including critical) patients have multiorgan failure more often. Also, among the severe patients, six patients had to be intubated. And till now successfully two extubations have been done. Other patients responded well to oxygen supply through High Flow Nasal Oxygen (HFNO) and Non Re-breather Mask (NRBM).

Limitation(s)

The present study had the following limitations. Firstly, the study sample is not enough to predict the accurate demographic profile of whole of the West Bengal. Also, it is not multicentric study. Secondly, markers like IL-6 and its effect on progression of the disease has to be evaluated. Despite all this the present study will help clinicians posted in the front line to have an idea how to predict the disease severity early in the course of the disease.

CONCLUSION(S)

In a tertiary care hospital of Kolkata, total 573 COVID positive patients were examined clinically; and biochemical profiles of these patients were documented. Fever was the most common presentation followed by dry cough and fatigability. Diabetes and hypertension were the common co-morbidities in COVID-19 patients. CRP, NLR, D-dimer, prothrombin time, SGOT and SGPT should be monitored to differentiate between mild and severe cases. Accordingly, early treatment should be initiated to prevent progression of the disease.

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PARTICULARS OF CONTRIBUTORS:
1. Senior Resident, Department of Medicine, Medical College, Kolkata, West Bengal, India.
2. Junior Resident, Department of Medicine, Medical College, Kolkata, West Bengal, India.
3. Junior Resident, Department of Medicine, Medical College, Kolkata, West Bengal, India.
4. Senior Resident, Department of Medicine, Medical College, Kolkata, West Bengal, India.
5. Professor, Department of Medicine, Medical College, Kolkata, West Bengal, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Sanjay Kumar Mandal,
86/13, Brojen Mukherjee Road, Kolkata-700034, West Bengal, India.
E-mail: sanjaypgcal@yahoo.co.in