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Original Research Article

Laboratory biomarkers of COVID-19 outcome: findings from a high dependency unit of South Bengal

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ABSTRACT

Background: Coronavirus disease-19 (COVID-19) has become a world wellbeing compromise. The danger factors for unfavorable occasions of coronavirus disease-19 (COVID-19) have not been very much depicted. This study aimed to explore clinical characteristics, laboratory results, and CT imaging characteristics of COVID-19 patients in Midnapore medical college and hospital and provide evidence for the prevention and treatment of COVID-19.
Methods: In this retrospective, single-center study, data of all confirmed patients with COVID-19 admitted at SARI HDU of Midnapore medical college and hospital from 1st July to 21July 2021 were collected and analyzed. Data including clinical presentations, basic laboratory investigations, and CT severity scores were analyzed and compared between survival and death patients.
Results: In this study total of 81 patients of COVID-19 admitted at SARI HDU were included (male=50, female=31). The patients were divided into 2 groups according to the outcome: survival group (n=38) and death group (n=43). Information on the overall clinical characteristics of the patients was collected, including age, sexual orientation, past medical history, clinical symptoms, and so on. Compared with the patients in the Survival group, the patients in the death group, the proportion of patients presented with Dyspnoea and suffering from Diabetes and hypertension were higher ($p<0.05$). In patients of the death group, TLC, CRP, D-dimer, urea, and creatinine had higher values, while the levels of albumin were significantly reduced, and the differences were statistically significant ($p<0.05$). Between the Survival group and death group, there was no significant difference in other indexes such as NLR, platelet count, and liver enzymes (SGOT, SGPT) ($p>0.05$).
Conclusions: The risk factors of comorbidities, like diabetes, hypertension and others like leucocytosis, high CRP, high d-dimer, altered renal function, low serum albumin, and higher CT severity score could help clinicians identify patients with potential adverse events**.**

Keywords: COVID-19, Survival group, Death group, CRP, D-dimer, CTSS

INTRODUCTION

In December 2019 a few cases of pneumonia associated with exposure to the Wuhan Seafood market (China) were reported and found to be caused by novel coronavirus SARS-COVID-2. The infection emerged on a large scale from Wuhan and spread all over the world in January 2020, and is now known to be transmitted by person-to-person contact. The disease caused by SARS-CoV-2 infections is called coronavirus disease 2019 (COVID-19) by WHO, and the COVID-19 pandemic was declared as a public health emergency of international concern on January 30, 2020.[1] Clinical symptoms are mainly characterized by fever, dry cough, anorexia, and so forth few patients will have dyspnoea, muscle irritation, and other symptoms, and serious patients might

advance to acute respiratory distress signs, sepsis, coagulation problems, and various organ dysfunction, or even death.[2]

With the flood in COVID-19 cases across the globe because of its profoundly infectious nature, there have been various investigations that have provided details regarding the predictors of sickness seriousness in COVID-19 patients. Studies have shown that extreme or deadly instances of COVID-19 illness are related to a raised white blood cell count, serum urea and creatinine, markers of liver function, C reactive protein (CRP), interleukin-6 (IL-6), low lymphocyte (<1000/µl), and platelet count (<100x109/l), serum albumin levels, compared with milder cases in which recovery is the outcome.[3] Among hematological parameters, lymphopenia is related to illness seriousness; patients who have died from COVID-19 have had essentially lower lymphocyte counts than survivors. Repletion of lymphocytes might be a significant factor for recovery.[4] C-reactive protein (CRP) levels are increased in COVID-19 patients and it has been shown that survivors had a median CRP value of roughly 40 mg/l, while non-survivors had a median value of 125 mg/l, indicating a strong correlation with illness severity and prognosis.[4] Coagulopathy was accounted for, and rising D-dimer was seen in 3.75–68.0% of the COVID-19 patients. Past studies in patients with community-acquired pneumonia (CAP) and chronic obstructive pulmonary disease (COPD) patients have shown that D-dimer level is higher in serious cases and might be utilized as a prognostic biomarker, and D-dimer >1 µg/ml is one of the danger factors for mortality in grown-up inpatients with COVID-19.[5]

Aim

In this study, we aimed to examine demographic characteristics, modes of clinical presentation, and simple laboratory biomarkers of the patients who were admitted in our SARI-HDU being positive of COVID-19 confirmed by the RT-PCR method.

METHODS

Patient's information

We have selected 81 patients diagnosed with COVID-19 confirmed by the RT-PCR method admitted in SARI HDU of Midnapore medical college and hospital, Paschim Medinipur, West Bengal from 1st July to 21st July of 2021. This SARI HDU has been deputed for the management of severe COVID-19 patients according to the existing government protocol. Among them 50 were male and 31 were female. The mean age of the patients was 53.79±15.84. The general clinical characteristics of the patients were collected, including age, gender, clinical symptoms, basic laboratory investigations, and CT severity score (from HRCT thorax). All the data were collected from the BHTs (bed head tickets) in SARI HDU. For the study purpose, all patients were divided into two groups: survival (38 patients, 46.9%) and death (43 patients, 53.1%).

Laboratory investigations

It is a retrospective study of 81 patients of COVID-19 admitted to HDU of Midnapore medical college and Hospital. All patients underwent complete blood count, CRP, D-dimer, urea, creatinine, sodium, potassium, liver function test, HRCT thorax. CT severity score(CTSS) was obtained from the HRCT thorax.

Statistical analysis

We have used statistical software IBM SPSS 20.0 for data analysis, measurement data of normal distribution was expressed as mean±SD (x±s), and independent-sample t-test was used for comparison between groups; count data were expressed by rate n (%), and Pearson $\chi 2$ test or Fisher's exact test was used, $p<0.05$ was considered statistically significant.

RESULTS

Clinical presentations and co-morbidities

From 1st July to 21st July of 2021, 81 patients infected with COVID-19 were admitted to SARI HDU of Midnapore medical college and hospital, and all these patients were categorized as severe COVID-19 cases as per existing government guidelines. The cases were divided into two groups, survival and death to compare clinical presentations, co-morbidities, and laboratory biomarkers. Among a total of 81 patients, 38 (46.91%) and 43(53.09%) were listed in survival and death group respectively. The mean (±SD) ages were 51.61±15.06 and 55.72±16.42 in survival and death respectively. There were 50 (61.7%) male and 31 (38.3%) female patients in this study. There was no significant difference between the two groups in terms of age distribution ($p=0.724$) and sex composition ($p=0.105$). Fever (79.01%) was the most common symptom in both survivals (34.56%) and death (44.44%) groups. Dyspnoea (64.19%) and cough (43.20%) were the other cardinal symptoms of presentation. The common co-morbidities in order of descending frequencies were; hypertension (38.27%), diabetes (27.16%), hypothyroidism (9.87%), chronic renal disease (3.7%), and malignancy (1.23%). Compared to the survival group, death cases had a significantly higher proportion of hypertension and diabetes, the differences were statistically significant ($p< 0.05$) (Table 1).

Comparison of laboratory biomarkers between 2 groups

In this study we found total leukocyte count (TLC), C-reactive protein (CRP), d-dimer, urea, creatinine, and CT severity score (CTSS) were significantly higher in the death group compared to the survival group, the

differences were statistically significant (p<0.05). Serum albumin level was found to be significantly low in the death group compared to that of the survival group (p< 0.05). The neutrophil-to-lymphocyte ratio (NLR), platelet count, SGOT, SGPT were also compared between the two groups, but the differences were not statistically significant (p>0.05), (Table 2).

Table 1: Information of 81 COVID-19 patients, clinical presentations and co-morbidities.

Parameter	Total (n=81)	Survival (N=38) Frequency (%)	Death (N=43) Frequency (%)	$\chi 2$	P value
Age (mean±SD)	53.79±15.84	51.61±15.06	55.73±16.42	1.17 (t-value)	0.724
Sex	M-50 F-31	M-27 (54) F-11 (35.5)	M-23 (46) F-20 (64.5)	2.63	0.105
Fever	64	28 (43.8)	36 (56.2)	1.22	0.268
Dyspnoea	52	18 (34.6)	34 (65.4)	8.82	0.003
Cough	35	20 (57.1)	15 (42.9)	2.58	0.108
Anorexia	16	8 (50)	8 (50)	0.07	0.782
Chest pain	2	2 (100)	0	2.32	0.128
Hypertension	31	10 (32.3)	21 (67.7)	4.33	0.037
Diabetes	22	4 (18.2)	18 (81.8)	10.01	0.002
Hypothyroid	8	2 (25)	6 (75)	1.71	0.191
CKD	3	3 (100)	0	2.75	0.097
Malignancy	1	1 (100)	0	1.14	0.084

Table 2: Comparison of laboratory biomarkers and CT severity score results between two groups of COVID-19 patients.

Parameters	Survival (mean±SD)	Death (mean±SD)	t	P value
TLC(×10^3/dl)	9.55±4.9	14.08±7.24	3.17	0.002
NLR	4.51±3.36	5.52±3.17	1.35	0.181
Platelet(×10^3/dl)	185±89.17	166.20±49.94	-1.20	0.232
CRP	31.59±25	81.64±31.33	17.05	0.000
d-dimer	603±539.64	3771.24±1312.70	10.94	0.000
Urea	31.79±17.15	57.38±33.19	3.04	0.003
Creatinine	1.03±0.25	1.54±1.41	2.04	0.04
SGOT	55.23±29.39	56.50±25.29	0.18	0.854
SGPT	54.32±22.69	64.47±19.18	1.91	0.060
Albumin	3.88±0.52	3.43±0.52	-3.41	0.001
CTSS	14.04±3.58	17.93±1.43	5.47	0.000

Comparison of life support measures

In our study, we found BIPAP support was needed in 19 (23.45%) patients, 3 in survival (15.8%), and 16 (84.2%) in the death group. HFNC was needed in 21(25.92%) patients, 6 in survival (28.6%), and 15 in the death (71.4%) group, and mechanical ventilation was needed for 3 patients, all of them were expired.

DISCUSSION

Our study included 81 patients with COVID-19 with a mean age of 53.79, 50 were male and 31 were female. No significant difference was found between the survival and death group in age and sex composition (p>0.05).[2] In this study common symptoms of presentation were fever (43.8% in survival and 56.2% in the death group), dyspnoea (34.6% in survival and 65.4% in the death group), cough (57.1% in survival and 42.9% in death group). Dyspnoea was found to be significantly higher in the death group (p<0.05).[6-8] Other modes of presentation were anorexia (19.75%), chest pain (2.46%).

Previous studies have suggested that hypertension was a risk factor for adverse outcomes of COVID-19 patients, our study shows the presence of hypertension was significantly higher in the death group compared with the survival (p<0.05).[9-11] Diabetes was present in 22 patients,

4 in survival (18.2%) and 18 in death patients (81.8%) and found to be statistically significant while comparing between two groups ($p<0.05$).[12-14] Hypothyroidism was found in 2 patients in survival and 6 patients in the death group and was not found to be significantly higher in the death group ($p> 0.05$).[15] In our study chronic kidney disease(CKD) was not associated significantly with the death group compared with the other one ($p>0.05$), however, in some previous studies, CKD had been considered as an important mortality predictor in COVID-19 patients.[16]

Among the hematological parameters, total leukocyte counts (TLC), neutrophil to lymphocyte ratio (NLR), Platelet count were compared between two groups. This study shows TLC is significantly increased in the death group.[17,18] In some previous studies significant correlations have been shown between increased NLR and thrombocytopenia (decreased platelet count) with mortality in COVID-19 patients, but this study shows NLR in the survival and death group was 4.51±3.36 (M±SD) and 5.52±3.17 (M±SD), which was not statistically significant ($p>0.05$) and also platelet count did not show any statistically significant difference between two groups.[19,20] In our study, CRP and D-dimer were increased in both the survival and death group and both of them are significantly increased in the death group compared to the survival group, $p<0.05$ in both cases.[21-23]

Multiple studies have identified kidney injury as a sequela frequently present in the COVID-19 patients with severe disease, many of whom expired.[24] In our study urea and creatinine were significantly higher in the death group compared to survival ($p<0.05$).[25,26] In many previous studies it is established that albumin is well known to act as a negative acute inflammatory reactant and in our study albumin was found to be significantly low in the death group compared to survival ($p<0.05$).[25,27] In some studies, elevated liver enzymes were found to be an important prognostic indicator of mortality in COVID-19 patients.[28] But in this study liver enzymes (SGOT,SGPT) were not significantly increased in the death group. CT severity score (CTSS) was significantly correlated with mortality risk in covid-19 patients in some previous studies.[29] In this study, CTSS found to be significantly increased in the death group compared to the survival group.

CONCLUSION

We conclude that the typical clinical characteristics of COVID-19 include fever, dyspnoea, cough, anorexia. Diabetes and hypertension might be considered as risk factors for the outcome of COVID-19 infection, and more intensive attention should be paid to patients with diabetes and hypertension. Total leukocyte count, increased CRP, increased d-dimer, increased urea and creatinine, decreased serum albumin, and high CT severity score is associated with increased mortality risk in COVID-19 patients. This predictive study can help clinicians to make timely clinical decisions, and make optimal use of limited laboratory resources and improve individual treatment.

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