Orginal Article

Changes Seen in Platelets and Coagulation Profile in SARS-CoV-2 Infection

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Abstract

Introduction: COVID-19 is a multisystemic disease with profound effects on the hematolymphoid and coagulation system. It is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) belonging to the Coronaviridae.

Objectives: To evaluate the platelet and coagulation profile in patients with SARS-CoV-2 infection.

Methods: A descriptive (cross-sectional) study, conducted in KIST medical college and teaching hospital (KIST MCTH), as census data, from 1st June 2021 to 30th December 2021

Results: COVID-19 association was seen more in male patients and most of the admitted patients had moderate severity. N:L ratio was higher in 55.6% (n= 29) admitted cases. In the admitted patients of COVID thrombocytopenia was noted in only 10 patients. Forty-two patients had normal platelets. Nine patients had raised Prothrombin time and 21 patients had raised D-dimer.

Conclusion: Unlike most viral infections, COVID-19 shows systemic inflammation and DIC features with lymphopenia and increased D-dimer. Thrombocytopenia is not associated with less severe cases; thus, it cannot be used as a prognostic factor.

Keywords: *Coronavirus, COVID 19, D-dimer, N:L ratio, platelets*

Introduction

Coronavirus disease 2019 (COVID-19) is a respiratory tract disease, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). It is highly contagious a positive-strand RNA virus belonging to the family Coronaviridae.[1] SARS-CoV-2 binds with an intrinsic membrane protein, angiotensin-converting enzyme 2 (ACE 2), which activates the renin-angiotensin-aldosterone system. ACE 2 is expressed in different organs, lung alveolar pneumocytes, endothelial cells, the heart, and kidneys.[2]

Though COVID affects the respiratory tract primarily, changes in hematological parameters are seen. In hematology, lymphopenia, thrombocytopenia, coagulation abnormalities, and disseminated intravascular coagulation (DIC) is encountered. In the autopsy of the patients who died of COVID-19, there were depleted lymphocytes in the lymph nodes, spleen, and bone marrow.[1] DIC is defined as increased prothrombin time (PT), elevated D-dimer, and thrombocytopenia according to the International Society of

Thrombosis and Hemostasis (ISTH). However, in COVID 19 there is mild thrombocytopenia, with or without elevated D- dimer, and mild to no increase in PT. This indicated that there is an ongoing thrombotic event in COVID-19 similar to DIC.[2] Hematological parameters can be used as used as therapeutic monitoring among the patients of COVID-19. In the COVID-19 patients' mild thrombocytopenia and lymphopenia were the major findings, which could also be used as prognostic CBC parameters. PT and D-dimer can also be used as the prognostic factor.[4]

Results

A total of 52 patients were admitted to the KIST MCTH during the study period. The mean age of the patient was 54.12 years (SD ±15.59), the youngest adult being 21 years old and the oldest being 86 years old. Of 52 admitted patients, 23 (44%) were female, and 29 (56%) were male. According to the clinical assessment of the admitted patients, 12% (n= 12) had mild COVID, 52% (n= 27) had moderate COVID and 25% (n= 13) had severe COVID. Among the severe COVID patients, eight were female and five were male (Figure 1).

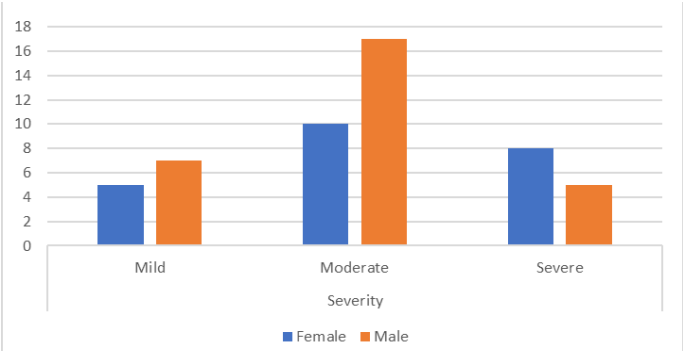

Fig 1: Gender * Severty

The complete blood count was within the normal limits of 39 patients, with leukopenia in 10 patients, and leukocytosis in three. N:L ratio was within the normal range (0.7 to 3) in 26 admitted patients, most of them were suffering from mild to moderate COVID. N:L ratio was higher in 55.6% (n= 29) admitted cases (Table 1).

Table 1: N:L ratio * Severity Crosstabulation

Mild		Severity			Total
		Moderate	Severe		
N:L ratio	3.04	1	0	0	1
	3.08	0	1	0	1
	3.35	0	1	0	1
	3.67	0	0	1	1
	3.85	1	0	0	1
	4.00	1	3	0	4
	4.21	0	1	0	1
	4.56	1	2	0	3
	5.25	0	1	1	2
	6.14	0	1	2	3
	6.62	0	1	0	1
	6.69	1	0	0	1
	7.33	0	2	1	3
	9.00	1	1	1	3
	24.00	0	1	0	1
	32.33	0	1	0	1
	56.93	0	1	0	1
Total		6	17	6	29

In the admitted patients of COVID thrombocytopenia was noted in only 10 patients. Forty-two patients had normal platelets (Table 2). Out of 10 thrombocytopenia cases, four patients had mild COVID, three patients had moderate COVID and three had severe COVID.

Table 2: Platelets * Severity Crosstabulation

Mild		Severity			Total
		Moderate	Severe		
Platelets	<1,50,000	4	3	3	10
	150000-4,50,000	8	24	10	42
Total		12	27	13	52

Nine patients had prolonged prothrombin time (PT) i.e., >14 secs (thromboplastin), and increased INR i.e., > 1 (Table 3).

Table 3: PT * Severity Crosstabulation

		Severity			
Mild		Moderate	Severe		Total
PT	12	1	0	0	1
	13	5	9	6	20
	14	5	13	4	22
	15	0	2	0	2
	16	1	3	2	6
	17	0	0	1	1
Total		12	27	13	52

40.38% (n=21) of patients had raised D-dimer (> 0.5), two of them had mild disease, 11 had moderate disease and 8 had severe disease.

Methods

This is a descriptive (cross-sectional) study, conducted in KIST medical college and teaching hospital (KIST MCTH), as census data, from 1st June 2021 to 30th December 2021, in COVID-19 patients who were diagnosed and admitted in the medicine ward by Real-Time Polymerase Chain Reaction (RT-PCR). All the data was collected from the hospital record after approval from the Institutional Review Committee of KISTMCTH. Pediatric COVID-19 cases were excluded from the study.

Discussion

COVID-19 is a multisystemic disease with the involvement of more than two organ systems. Most of the effects of COVID-19 were noted in the hematolymphoid system. In most of the studies, thrombocytopenia was the most notable feature, with an increased N:L ratio. However, in this study, lymphopenia was noted in most of the patients than thrombocytopenia, which was similar to the study done by Cheung et al.[4] In the study done by Toori et al.[5] N:L ratio was regarded as the prognostic factor in COVID-19 patients, which was consistent with the findings of our study. Increased N:L ratio was seen in the moderate and severe cases of COVID-19. In mild COVID-19 cases, only 6 cases had mild lymphopenia. This suggests that lymphopenia is suggestive of an increase in the severity of the disease. Neutrophils kill the virus-affected cell by producing reactive oxygen species and releasing the virus from cells. Neutrophils also release cytokines and interleukins (IL) for further removal of organisms. In patients with systemic inflammation, IL-6 production is increased. IL-6 suppress the lymphocytes in response to systemic inflammation which leads to leukopenia in COVID-19 patient, even though the patients are suffering from viral infection.

COVID-19 has more association with males in most of the studies, which was similar to the findings of our study.[4]

Initially, during the outbreak of the disease, it was thought that platelets are an independent risk factor for severity. But many studies were done later on and the finding on platelet count was inconsistent.[6] In a few studies, they found that thrombocytopenia could be used as a prognostic factor in ICU patients.[4]

Coagulation in COVID-19 has been one of the major concerns. In coagulopathy, there are increased PT and D-dimer levels, indicating an ongoing thrombotic process.[4,7] PT was within the normal range in most of the cases. There was raised PT in nine patients and they were either suffering from moderate or severe COVID-19. However, D-dimer was raised in 21 patients and most of them were suffering from moderate and severe diseases. This indicates that with the increase in the severity of the disease, there is an increase in systemic inflammation and the formation of microthrombi, predisposing the patient to DIC.

Conclusion

N:L ratio, D-dimer, and PT can also be used as one the parameters to monitor the severity of the disease. However, platelets can be used as the prognostic and monitoring factor in patients admitted to ICU. Platelet level cannot be used as a prognostic factor in less severe cases.

References

1. Tal S, Spectre G, Kornowski R, Perl L. Venous Thromboembolism Complicated with COVID-19: What Do We Know so Far? Vol. 143, Acta Haematologica. S. Karger AG; 2020. p. 417-24.
DOI: 10.1159/000508233
PMID: 32396903 PMCID: PMC7270063

2. Wool GD, Miller JL. The Impact of COVID-19 Disease on Platelets and Coagulation. Vol. 88, Pathobiology. S. Karger AG; 2021. p. 15-27.
DOI:10.1159/000512007
PMID: 33049751 PMCID: PMC7649697

3. Pourbagheri-Sigaroodi A, Bashash D, Fateh F, Abolghasemi H. Laboratory findings in COVID-19 diagnosis and prognosis. Vol. 510, Clinica Chimica Acta. Elsevier B.V.; 2020. p. 475-82.
DOI: 10.1016/j.cca.2020.08.019
PMID: 32798514 PMCID: PMC7426219

4. Cheung CKM, Law MF, Lui GCY, Wong SH. Coronavirus Disease 2019 (COVID-19): A Haematologist's Perspective. Vol. 144, Acta Haematologica. S. Karger AG; 2021. p. 10-23.
DOI:10.1159/000510178
PMID: 32721958 PMCID: PMC7490512

5. Toori KU, Qureshi MA, Chaudhry A, Safdar MF. Neutrophil to lymphocyte ratio (Nlr) in covid-19: A cheap prognostic marker in a resource constraint setting. Pak J Med Sci. 2021 Sep 1;37(5):1435-9. DOI:10.12669/pjms.37.5.4194

6. Duarte FB, Lemes RPG, Duarte IA, Duarte BA, Duarte JVA. Hematological changes in Covid-19 infections. Vol. 66, Revista da Associacao Medica Brasileira. Associacao Medica Brasileira; 2020. p. 99. DOI:10.1590/1806-9282.66.2.99 PMID: 32428139

7. Tal S, Spectre G, Kornowski R, Perl L. Venous Thromboembolism Complicated with COVID-19: What Do We Know so Far? Vol. 143, Acta Haematologica. S. Karger AG; 2020. p. 417-24. DOI:10.1159/000508233 PMID: 32396903 PMCID: PMC7270063