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Hematological Parameters for COVID-19 Cases

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KEYWORDS

HT,P, COVID-19, clinical profile, complications, disseminated intravascular coagulation, professionals, severity , prognosis, relationship

ABSTRACT

Over the past few decades, the Corona virus has emerged as a significant global health concern, leading to severe respiratory illness and long-term health complications. Thoroughly analyzing hematology indices helps medical professionals develop personalized treatment plans and deliver specialized care to patients in critical conditions. Identifying potentially life-threatening complications, such as disseminated intravascular coagulation, early on and intervening effectively can greatly enhance the patient's prognosis. According to a source, there is a reference to a specific point or piece of information. Therefore, the objective of this study was to assess the HT-P and their relationship with the clinical profile, enabling clinicians to determine the severity and prognosis of patients with COVID-19. Therefore, our study has led us to the conclusion that closely monitoring these levels is beneficial for effective patient management. By understanding the relationships between these parameters and clinical profiles, healthcare professionals are able to evaluate the severity and prognosis of individuals with COVID-19 illnesses.

1. INTRODUCTION

Pneumonia, bronchitis, and Severe Acute Respiratory Syndrome (SARS) are all lower respiratory tract infections(RTI). When the Corona virus infects people, it may cause illnesses of varying severity, including upper respiratory tract infections similar to the common cold, liver, intestinal, and neurological issues. [1,2,3] Studies also concluded that at the moment, there is no effective antiviral treatment for COVID-19 [4], and information about SARS-CoV-2 is limited. The number of reported cases and deaths rises dramatically on a daily basis in a variety of worldwide areas. Early infection identification and prevention have emerged as essential goals in the treatment of this Corona virus. [5] Studies also concluded that health practitioners may find it useful to be aware of the hematological changes that occur in SARS-CoV-2 infection.: Lymphocytopenia(LP), neutrophilia(NP), eosinopenia(EP), mild thrombocytopenia(TP), and thrombocytosis(TC) are the most common hematological results. Other findings include TC.[6,7] According to a meta-analysis, leucocytosis(LC), LP, and TP are associated with increased severity and even death in COVID-19 patients: It is most common to detect these changes between the seventh and fourteenth days after infection.[8,9] Therefore, in our study, we have examined the hematological parameters(HT-P) and their relationship

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with the clinical profile, which enables the doctor to evaluate the severity and prognosis of patients with COVID-19.

AIM

To study HT-P observed in COVID-19 cases.

2. MATERIAL AND METHOD

The current study was a two-year hospital-based cross-sectional and observational study of all HT-P in all indoor patients admitted with COVID-19 infection in a tertiary care center from August 2020 to July 2022, including 700 cases, conducted in the pathology department of an attached tertiary care hospital.

INCLUSION CRITERIA

All cases admitted with COVID-19 infection above 17 years of age.

EXCLUSION CRITERIA

1. Pediatric cases
2. OPD cases

MATERIALS

1. 5 – Part Automated HT analyser - Nihon Kohden MEK – 9100K
2. Slides: Clean, grease free slides
3. Vacutainer: EDTA vacutainers, Citrate vacutainer
4. Westergren pipette for Erythrocyte sedimentation rate)
5. Coagulation machine (Stago Coagulation)
6. Stain: Leishman stain, Geimsa stain
7. D- Dimer machine - Stago STA Satellite Max fully automated machine
8. Other material: Sterile disposable gloves, spreader slide, micro pipette.

HT INVESTIGATION

The HT laboratory conducted standard HT investigations for Covid-19 patients, including assessments of hemoglobin, total leucocyte count, DLC , PC, erythrocyte sedimentation rate (ESR), bleeding time (BT), and CT.

Blood for hematological examination was collected in E.D.T.A. vacutainer.

(i) Hemoglobin estimation, cell counts for example white blood cell andplatelet count were recorded on 5- part Automated Hematology analyser (Nihon Kohden MEK – 9100K)

(ii) Peripheral blood smears were made from venous blood collection in E.D.T.A. vacutainer. Smears were stained by Leishman stain and morphology of RBC, WBC and platelets were studied.

Processing

The blood was drawn from the veins using an EDTA vacutainer. We used oil immersion amplification at a very high power to color blood smears with the Leishman stain and looked at them for RBC morphology, TLC, differential WBC, and platelet count was done.

HT LABORATORY QUALITY CONTROL

According to the standard rules given for laboratories, the internal quality control program is continued in our HT, and the laboratory took part in the external quality control program by Bio-Rad.

ERYTHROCYTE SEDIMENTATION RATE (ESR):

ESR was done by Modified Westergren Method Sample for ESR test was collected in EDTA vacutainer.

BLEEDING TIME (BT):

BT was done by Duke's method

CLOTTING TIME (CT):

CT was done by Capillary method

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BIOCHEMICAL TESTS:

- Aspartate transaminase, Alanine transaminase and Alkaline phosphatase were analysed for the liver function test. The blood sample was collected in plain vacutainer.
- Serum creatinine were analysed for renal function test. The blood sample was collected in plain vacutainer.
- Serum ferritin test sample was collected in plain vacutainer. It was centrifuged and serum separated was used for the test.

C- Reactive protein was done by RHELAX-CRP kit.

HRCT (High-Resolution Computed Tomography) was conducted using SIEMENS SOMATOM EMOTION 16 slice computed tomography system.

STATISTICAL ANALYSIS

The collected data from clinically diagnosed cases of COVID-19 infection were analyzed using SPSS software to determine the correlation between hematological parameters and the clinical profile. Other tests, such as the liver function test, serum creatinine, serum ferritin, D-dimer, and high-resolution computerized tomography, were also conducted. Our study utilized the Chi-square test and the ANOVA test for analysis and assessed the sensitivity, specificity, positive predictive value, and negative predictive value of the hematological parameters in clinically confirmed cases of COVID-19 infection.

RESULT

Mean Hemoglobin level (gm/dL) Normal range: 12-15 gm/dl	**Severity of illness**		
	Mild (n=72)	**Moderate (n=533)**	**Severe (n=95)**
Mean Hemoglobin(Hb)	13.10	11.89	10.63
SD	1.89	1.72	2.16
Min.	8.8	5.1	7.1
Max.	16.6	17.8	18.1
ANOVA F-value	30.04		
p-value	<0.0001		

Table 1:Comparison of severity of illness & mean hemoglobin

In table 1, among the COVID-19 cases that were examined, a comparison was conducted between the severity of the illness and the level of Hb in the patients. When analyzing the COVID-19 cases, it was found that the mean Hb level for M-SV cases was 13.10±1.89, while the MD group had a Hb level of 11.89±1.72 and the SVgroup had a Hb level of 10.63±2.16.

Mean Total Leucocyte Count (cell/mm^3) Normal range: 4000- 11000/mm^3	**Severity of illness**		
	Mild (n=72)	**Moderate (n=533)**	**Severe (n=95)**
Mean	6323.88	10672.36	11559.52
SD	1736.7	5270.5	6298.5
Min.	2600	2000	1330
Max.	10100	22300	34500
ANOVA F-value	25.34		
p-value	<0.0001*		

Table 2: Comparison of SV & MTLC

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In table 2, we have found that ,the MTLC for M-SV of illness in COVID-19 cases was found to be 5803.03±1906.5. On the other hand, the count was found to be increased in the MD group to 7609.2±3792, and it was further increased to 12218.6±7488.1 in the SV group. There was a statistically significant rise in the TLC as the severity of the illness increased.

Mean Neutrophil count (%) Normal range: 40-75%	**Severity of illness**		
	Mild (n=72)	**Moderate (n=533)**	**Severe (n=95)**
Mean	64.84	71.62	85.43
SD	12.09	11.56	5.74
Min.	44	46	65
Max.	86	90	90
ANOVA F-value	84.188		
p-value	<0.0001*		

Table 3: Comparison of illness with netrophil count(NC)

In table 3, we have found that ,based on the findings of the research, it was found that the average NC for COVID-19 cases with M-SV illness was 64.84±12.09. As the severity of the illness increased, the count increased to 71.62±11.56 in the MD group, and it further increased to 85.43±5.74 in the SV group. The statistical significance of the difference in NC between M & SV cases of COVID-19 was shown.

Mean Bleeding Time (Minutes) Normal range: 2-7 minutes	**Severity of illness**		
	Mild (n=72)	**Moderate (n=533)**	**Severe (n=95)**
Mean	5.21	5.22	5.76
SD	1.42	1.64	2.02
Min.	3.2	2.4	2.4
Max.	8.3	9.5	9.7
ANOVA F-value	4.312		
p-value	0.014		

Table 4: Comparison of SV & MBT

In table 4, we have found that ,the average BT for those with M - COVID-19 symptoms was 5.21 ± 1.42. This time increased to 5.22±1.64 in the MD group and further increased to 5.76±2.02 in the SV group. The statistical significance of BT varied between M and SV cases of COVID-19.

Clotting Time (minutes) Normal range: 8-15 minutes	**Severity of illness**		
	Mild (n=72)	**Moderate (n=533)**	**Severe (n=95)**
Mean	12.78	13	13.03
SD	2.00	2.39	2.69
Min.	9.1	8.2	8.2
Max.	16.2	17.2	17.3
ANOVA F-value	0.387		
p-value	0.679		

Table 5: Comparison of SV & CT

In table 5, we found that individuals with M symptoms of COVID-19, the average CT was 12.78±2.00. In the M group, this time increased to 13±2.39, and in the S group, it further rose to 13.03±±2.69 respectively.

DISCUSSION

In our study, we found that a significant portion of the 700 individuals infected with COVID-19 fell into different age brackets. The study encompassed patients spanning a wide age range, from 18 to 93 years old. Similar findings were observed in Lokwani et al[10], Lingshuang Sheng et al[11]and Vineet banga et al[12]. The current research observed a higher proportion of males, with 484 (69.14%) male patients and 216 (30.86%) female patients. Lokwani et al.[13] observed a higher proportion of men, with 206 (68.7%) male patients and 94 (31.3%) female patients. In their study, J. Fu et al.[14] observed a higher proportion of men, with 45 (60%) male patients and 30 (40%) female patients. Sana, Avneesh,[15] and their colleagues noted that, 105 (70%) were men and 45 (30%) were girls.

	Authors				
Symptoms	**Huang Cet al[16]**	**Chen et al[17]**	**Chowdhury, Oommen et al[18]**	**Adekunle Sanyaolu et al[19]**	**Present study**
Fever	98%	93.6%	88%	88.8%	573 (81.85%)
Dry Cough	76%	75.9%	65%	68%	472 (67.42%)
Generalized Weakness	44%	12.2%	30%	33%	402 (57.42%)
Breathlessness	55%	44.2%	30%	17%	302 (43.14%)
Loss of Tasteand Smell	-	-	85%	-	154 (22%)
Sore Throat	-	3.3%	-	11.4%	27 (3.8%)
Others	3	-	10	-	46 (6.57%)

Table 6:Comparison of clinical presentation in COVID-19 cases with other studies.

Comparison of SV among COVID-19 cases with other studies

Another study similar to our found that the severe group followed by the mild group and moderate group at 22.7%[10].Anpther study by Mousavi-Nasab SD et al. [20], found that 80% of the participants were in the non-severe group, while the remaining 20% were in the severe group.

CONCLUSION

Hematological parameters like lower hemoglobin levels, higher WBC, higher neutrophil counts, lower lymphocyte counts, higher absolute neutrophil counts, lower absolute lymphocyte counts, and lower platelet counts are strongly linked to how bad the disease is and can be used to keep an eye on the patient.

Hence, through our study, we have come to the conclusion that monitoring these levels helps in better patient management as these parameters and their correlations with clinical profiles help clinicians assess the severity and prognosis of patients with COVID-19 illnesses.

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