Journal of Recent Advances in Medicine

JRAM
Journal of Recent Advances in Medicine
مجلة التطورات الحديثة في الطب
Print ISSN 2636-252X - Online ISSN 2636-2538

Original Article

COVID 19 associated coagulopathy

Pulmonology

Dalia S. Eldawash[1], Dina A. Ibrahim[2], Samiha M. Abu Bakr[3], Sabah S. Oraby[3]

[1]Chest Diseases Department, Al-Ahrar Teaching Hospital, Zagazig, Egypt.
[2]Clinical Pathology Diseases Department, Al-Ahrar Teaching Hospital, Zagazig, Egypt.
[3]Chest Diseases Department, Faculty of Medicine for Girls, Al-Azhar University, Cairo, Egypt.

ABSTRACT

Background: Critically ill COVID-19 patients are presented with coagulopathy and disseminated intravascular coagulation like massive clot formation. Consequently, coagulation tests are useful to distinguish severe cases of COVID-19.

Objective: to assess the role of prothrombin time (PT), D-dimer, platelet (PLT) count, and fibrinogen for detection of coagulopathy in patients with COVID-19 and to assess their relation to disease severity.

Methodology: A cross sectional study was conducted on 80 patients with polymerase chain reaction (PCR) confirmed COVID-19 infection. The presenting symptoms, smoking, comorbidities, and high-resolution computed tomography of chest (HRCT) findings were reported. Measurements of the following laboratory parameters were done; complete blood count, liver and renal function tests, arterial blood gases, erythrocyte sedimentation rate, serum ferritin, C-reactive protein, PT, PTT, D-dimer and fibrinogen. Based on COVID severity criteria, they were classified into mild, moderate, severe, and critical cases.

Results: Among the studied cases there were 33.75% have mild, 13.75% moderate, 38.75% severe and 13.75% critical COVID-19 infection. The dyspnea was significantly common in severe and critical groups ($p< 0.001$), while sore throat was significantly common in mild and moderate groups ($p< 0.001$). The ferritin was significantly higher in patients with either severe or critical COVID-19 than those with mild COVID-19, and in patients with severe COVID-19 than those with critical COVID-19. The severe and critical groups have significantly higher CORAD???-score compared to either mild or moderate groups. The white blood cells was significantly higher in the critical group than the mild group. The level of D-dimer and fibrinogen were significantly higher in the severe and critical groups compared to either the mild or moderate groups. The PT, PTT, D-dimer and fibrinogen have fair sensitivities and specificities for determination of COVID-19 severity, and for detection of critical COVID-19.

Conclusion: Coagulation biomarkers increases in COVID-19 infected patients, and they increased further as the severity of the disease increased.

JRAM 2023; 4(1):155-161

Keywords: SARS-COV2, D-dimer, fibrinogen, CAC, DIC.

Submission Date: 5 September 2023 **Acceptance Date:** 17 September 2023

Corresponding author: Dalia S. Eldawash [1]Chest Diseases Department, Al-Ahrar Teaching Hospital, Zagazig, Egypt.. **Tel:** 01012379622 **. E-mail:** daliaeldawash@gmail.com

Please cite this article as: Eldawash DS, Ibrahim DA, Abu Bakr SM, Oraby SS. COVID 19 associated coagulopathy. JRAM 2023; 4(1):155-161. DOI: 10.21608/jram.2023.233251.1223

INTRODUCTION

In December 2019, an acute respiratory distress syndrome of unknown cause was detected in Wuhan, China. The 7th human coronavirus was discovered in Wuhan, the recent outbreak of pneumonia in January 2020 [1]. After that, the virus spread all over the world, and infect millions of people [2].

Once the scientists discovered severe acute respiratory distress syndrome-COV2 (SARS-COV2) pandemic, the clinical investigator found an increased coagulopathy among patients with COVID-19. This condition was documented in numerous research's and is consistent with the idea that COVID-19 associated coagulopathy (CAC) contributes to mortality and morbidity. The CAC is manifested as microthrombi and macrothrombi, resulting in multiple organ failure. So, coagulation tests may be beneficial to discriminate severe cases of COVID-19.

Changes in hemostatic biomarkers characterized by increase in D-dimer and fibrinogen indicate the presence of coagulopathy in massive clot formation [2]. In COVID-19 patients there is a strong relationship between the immune system, coagulation, fibrinolytic

and complement. Association of the immune response with coagulation in the microvasculature where endothelial cell damage encourages thrombus formation [3]. This study aimed to assess the role of prothrombin time (PT), D-dimer, platelet (PLT) count, and fibrinogen, for detection of coagulopathy in COVID-19 patients and to assess their relation to disease severity.

PATIENTS AND METHODS

This cross-section study was carried out at isolation department, Al-ahrar teaching hospital, Zagazig, Egypt, between July 2022 and January 2023. It included 80 patients with polymerase chain reaction (PCR) confirmed COVID 19.

Exclusion criteria

Patients with hypercoagulapathy or those treated by drugs causing hypercoagulability e.g. estrogen hormones and oral contraceptive pills, pregnant women, and patients during postoperative period (6 months) especially hip, knee and urinary system procedure were excluded from the study.

The study was approved by ethical committee of faculty of medicine for girls, Cairo, Al-Azhar university, Egypt. All studied patients or their relatives gave written consent after receiving appropriate information about the study.

Full medical history was taken including age, sex, smoking history, medication history, presenting symptoms, and associated comorbidities e.g. [diabetes mellitus (DM), hypertension (HTN), cardiac, hepatic, renal and any chronic disease].

The COVID-19 disease was diagnosed based on the protocol of Egyptian ministry of health and population. All patients were classified into four groups: mild, moderate, severe, and critical [4].

High resolution computed tomography of chest (HRCT) was done to detect radiological signs of COVID 19, which include: no abnormalities, ground glass opacity, consolidation patches, and fibrosis. Based on the CORAD-scoring the patients were classified into 5 categories [5].

Arterial blood gases (ABGs) analysis was performed to assess respiratory failure and acid base balance. The oxygen (O_2) saturation %, partial pressure of arterial of oxygen (PaO_2), partial pressure of arterial of carbon dioxide ($PaCO_2$), pH and bicarbonate were measured at time of admission. Complete blood count (CBC) was performed for assessment of white blood cells (WBCs), hemoglobin, lymphocytes %, and PLT count. Liver function tests, and kidney function tests were done. The erythrocytic sedimentation rate (ESR), serum ferritin, and C-reactive protein (CRP) were measured as an inflammatory marker in the studied patients.

For the evaluation of coagulopathy, the following indices were recorded; D-dimer, PT, PLT count, fibrinogen, partial thromboplastin time (PTT), and international normalization ratio (INR) were measured. For measurements of fibrinogen Two mL of blood was obtained by vein puncture from each subject in a vacationer tube with anticoagulant trisodium citrate 3.2% in the proportion of nine volume of blood to one volume of anticoagulant. Samples were centrifuged at 2500xg for 15 minutes at room temperature, then plasma was separated and stored at -70 till tests were done. Fibrinogen was measured by using, Stago - Liqid fibrinogen Kit (STA Liquid Fib kit) supplied by (Diagnostic Stago, France), which is a diagnostic assay for quantitative measurement of fibrinogen in plasma. The normal fibrinogen level by this kit was 2-4 g/L. The fibrinogen concentration was determined in plasma quantitatively by Clauss method, which calculate the fibrinogen ratio to fibrin conversion in diluted plasma by the effect of excess thrombin, then the clotting time was used to measure the fibrinogen concentration in plasma as the clotting time and fibrinogen level are inversely proportional in plasma.

Clot determination by using the Stago-compact auto-analyser (supplied by diagnostic Stago, France) which involve electromagnetic - mechanical system. The oscillation of a steel ball with the curette with the thrombin and diluted plasma was monitored by autoanalyser. Clot formation stops the oscillation of the steel ball, and the sensor records the time in seconds, the time was interpreted into fibrinogen concentration (g/L) from fibrinogen standard curve stored on STA compact autoanalyser and plotted on log-log paper. The frozen samples were quick thaw in 37°C water bath and the mixture was done by inversion for 10 seconds. The control was Re-form (normal, pathological) with one mL distilled water. All reagents were let to stand for at least 30 minutes at room air.

Statistical analysis

The data was analyzed by SPSS version 24. Parametric quantitative variables were presented as mean ± standard deviation (SD), while nonparametric variables were presented as median and interquartile range (IQR). Qualitative variables were presented as numbers and percentages. The analysis of variance (ANOVA) test was used to compare normally distributed data between more than two groups. Tukey highest significant (HSD) Post hoc test used to assess the significance of differences between pairs of group means. Kruskal Wallis (KW) test was used to compare non-normally distributed data between more than two groups. Multiple comparison of non-normally distributed data between two groups was done using the Pairwise test. Chi-square test was used to compare qualitative data. ROC test was used to determine sensitivity and specificity of studied coagulation indices in detection of COVID-19 severity as well as for prediction of critical ĈOVID-19. Probability was determined as: P-value < 0.05 was considered significant (95% confidence interval).

RESULTS

The mean age of studied patients was 59.28 ± 15.49 years, ranged from 19 to 88 years. 58.7% of them were

females, and 41.3% were smokers. Based on COVID-19 severity; 33.75% patients have mild, 13.75% have moderate, 38.75% have severe and 13.75%have critical COVID 19 (table 1). The dyspnea was significantly common in severe and critical groups (p <0.001), while sore throat was significantly common in mild and moderate groups (p <0.001). Cough and fever were non-significantly differ between groups (table 2).

The serum ferritin was significantly higher in severe and critical groups compared to mild group, and in critical group than severe group. While there were no significant differences between groups regarding ESR or CRP (table 3).

Severe and critical COVID-19 groups have significantly higher CORAD score compared to mild and moderate groups. The oxygen saturation % and PaO_2 were significantly lower in severe and critical groups compared to mild and moderate groups (p 0.001) (table 4).

Concerning CBC, the WBC was significantly higher in critical group than mild group. There was no statistically significant difference between the studied groups regarding hemoglobin, lymphocytes, or PLT count (table 5).

The coagulation profile indices (PT, PTT, INR, D-dimer and fibrinogen) were statistically significantly increased with progression of COVID-19 severity. Level of d-dimer and fibrinogen were significantly higher in severe and critical groups compared to mild and moderate groups (table 6).

The PT, PTT, D dimer and fibrinogen have fair sensitivities and specificities for determination of COVID-19 severity (table 7), and for detection of critical COVID-19 (table 8).

Table (1): Demographic data of studied patients

Item	Studied group (n= 80)
Age (year)	
- Mean ± SD	59.28 ± 15.49
- Range	19 – 88
Sex no. (%)	
- Female	47 (58.7%)
- Male	33 (41.3%)
Smoking status no. (%):	
- Nonsmokers	47 (58.7%)
- Smokers	33 (41.3%)
COVID severity no. (%):	
- Mild	27 (33.75%)
- Moderate	11 (13.75%)
- Severe	31 (38.75%
- Critical	11 (13.75%)

Table (2): Relation between COVID 19 severity and presenting symptoms

	Mild (no.=27) no. (%)	**Moderate (no.=11)** no. (%)	**Severe (no.=31)** no. (%)	**Critical (no.=11)** no. (%)	χ^2	**p-value**
Cough	20 (74.1)	10 (90.9%)	25 (80.6%)	7 (63.6%)	0.08	0.771
Fever	10 (37.0)	5 (45.5%)	17 (54.8%)	6 (54.5%)	1.872	0.171
Dyspnea	6 (22.2)	4 (36.4%)	22 (71.0%)	8 (72.7%)	15.243	0.001*
Sore throat	22 (81.5)	8 (72.7%)	14 (45.2%)	4 (36.4%)	10.704	0.001*

χ^2: Chi square * Significant p-value (<0.05)

Table (3): Relation between COVID severity and studied inflammatory markers

Inflammatory markers	**Mild**	**Moderate**	**Severe**	**Critical**	**KW**	**p-value**
ESR (mm/h) Median (IQR)	33(24- 43)	37(20- 55)	44(30-60)	43(40-76)	6.80	0.078
Serum ferritin (ng/ml) Median (IQR)	100(68-145)	217(60-340)	235(135-367)	389(356-436)	25.59	**P=0.001*** P1=0.33, P2=0.002* P3=0.001*, P4 =0.99 P5=0.12, P6 =0.001*
CRP (mg/dl) Median (IQR)	27(19.5-33)	39(20- 44)	33(20- 50)	37(23- 53)	7.18	0.06

KW: Kruskal Wallis test, IQR: interquartile range; * Significant p-value (<0.05), P1:Mild vs. moderate, P2:. Mild vs. severe, P3: Mild vs. critical, P4: Moderate vs. severe, P5: Moderate vs. critical . P6: Severe vs. critical.

Table(4):Relation between COVID 19 severity and both radiological and arterial blood gases findings

	Mild (no.=27)	Moderate (no.=11)	Severe (no.=31)	Critical (no.=11)	Stat. test	p-value
HRCT score: no. (%)						
CORADS 1	24 (88.9%)	1 (9.1%)	0 (0%)	0 (0%)		
CORADS 2	2 (7.4%)	1 (9.1%)	1 (3.2%)	0 (0%)		
CORADS 3	1 (3.7%)	7 (63.6%)	0 (0%)	0 (0%)	$\chi^2 = 9.1$	0.001*
CORADS 4	0 (0%)	2 (18.2%)	11 (35.5%)	1 (9.1%)		
CORADS 5	0 (0%)	0 (0%)	19 (61.3%)	10 (90.9%)		
ABG: mean ± SD						
O_2 saturation %	96.15 ± 1.54	93.55 ± 1.04	84.58 ±4.54	72.18 ±5. 79	F=12.35	0.001*
PaO_2 mmHg	93.31 ± 2.88	89.74 ± 1.94	61.66 ±3.79	53.61±4.54	F=19.22	0.001*
$PaCO_2$ mmHg	35(30-41)	33 (30-45)	40 (31.5-62.5)	41 (31-64.5)	KW= 4. 06	0.254
HCO_3 mEq/L	23.07± 4.92	22± 4.66	25.08± 9.86	24.83± 14.81	F= 0.48	0.692
pH	7.4 ± 0.06	7.42± 0.06	7.39± 0.09	7.31± 0.15	F =3.34	0.023*

HRCT: high resolution Computed tomography, PaO_2: Partial arterial pressure of oxygen, $PaCO_2$: Partial arterial pressure of carbon dioxide, HCO_3: Bicarbonate, pH: Power of hydrogen, ,χ^2: Chi square test, KW: Kruskal Wallis test, F: Analysis of variance test, * Significant p-value (<0.05)

Table(5):Relation of COVID 19 severity with hemoglobin platelet count, lymphocyte and white blood cells

CBC parameters	Mild (no.=27)	Moderate (no.=11)	Severe (no.=31)	Critical (no.=11)	Stat. test	p-value
Hemoglobin gm /dl Mean ± SD	11.32 ±1.93	11.08 ± 1.49	11.31 ± 2.4	11.26 ± 2.07	F = 0.03	0.99
Platelet PLTs count (10^3/ul) Median (IQR)	211(137- 278)	310(124-345)	214(148-246)	271(195- 313)	KW = 2.42	0.489
Lymphocytes % Median (IQR)	18(10- 30)	18(10- 22)	16(12- 22)	14(9 -21)	KW =0.95	0.813
WBCs (10^3/ul) Median (IQR)	7.8 (4.7-11.3)	8.9(6.3-15.3)	11.9(8.4- 16.7)	10.9(9.9-16.6)	KW =8.61	***P=0.035**** P1 = 0.999, P2 =0.298 P3=0.034*, P4 = 0.99 P5 = 0.99, P6 = 0.99

PLTs: Platelets, F: One way ANOVA test, KW: Kruskal Wallis test, IQR: interquartile range, * Significant p-value (<0.05), P1:Mild vs. moderate, P2:. Mild vs. severe, P3: Mild vs. critical, P4: Moderate vs. severe, P5: Moderate vs. critical . P6: Severe vs. critical

Table (6) Relation between COVID severity and studied coagulation profile indices

Coagulation profile indices	Mild (no.=27)	Moderate (no.=11)	Severe (no.=31)	Critical (no.=11)	Stat. test	p-value
PT (Sec) Mean ± SD	14.97±1.22	14.43±0.93	19.23±4.05	24.81±11.45	F =12.94	***P=0.001**** P1=0.99, P2=0.008*, P3=0.001*, P4=0.035* P5=0.001*, P6=0.01*
PTT(Sec) Mean ± SD	27.7±3.24	27.32±1.71	33.72±6.7	43.45±10.11	F=1.56	***P=0.001**** P1=0.99, P2=0.001* P3=0.001*, P4=0.015* P5=0.001*, P6=0.001*
Fibrinogen g/l Mean ± SD	2.37±0.86	3.17±1.2	4.12±1.58	6.96±2.26	F=27.40	***P=0.001**** P1=0.42, P2 =0.001* P3=0.001*, P4=0.024* P5=0.001*, P6 =0.001*
D-dimer mg/l Median (IQR)	0.46(0.32-0.6)	0.51(0.23-0.65)	0.81(0.64-1.1)	1.23(0.9-1.3)	KW=27.64	***P=0.001**** P1=0.99, P2=0.001* P3=0.001*, P4 =0.025* P5=0.004*, P6=0.99
INR Median (IQR)	1.07(1-1.18)	1.05 (1-1.15)	1.22 (1.13- 1.3)	1.2 (1.15- 2.29)	KW=18.72	***P=0.001**** P1=0.99, P2=0.001* P3=0.008*, P4=0.176 P5=0.16, P6=0. 99

F: One way ANOVA test, KW: Kruskal Wallis test, IQR: interquartile range, * Significant p-value (<0.05), P1:Mild vs. moderate, P2:. Mild vs. severe, P3: Mild vs. critical, P4: Moderate vs. severe, P5: Moderate vs. critical . P6:Ssevere vs. critical, PT: Prothrombin time, PTT: Partial thromboplastin time, INR: International Normalization ratio.

Table (7): Discriminative performance of prothrombin time, partial thromboplastin time, D dimer and fibrinogen in determination of COVID-19 severity

	Cutoff	AUC	95% CI	Sensitivity	Specificity	p-value
PT (Sec)	≥15.8	0.902	0.826 – 0.911	80.6%	78.9%	0.001*
PTT(Sec)	≥29.65	0.798	0.677 – 0.92	74.2%	73.7%	0.001*
Fibrinogen g/l	≥3.115	0.787	0.681 – 0.894	74.2%	73.7%	0.001*
D dimer mg/l	≥0.61	0.812	0.704 – 0.921	80.6%	76.3%	0.001*

AUC: area under curve, * Significant p-value (<0.05), CI: Confidence interval, PT: Prothrombin time, PTT: Partial thromboplastin time

Table (8): Discriminative performance -of prothrombin time, partial thromboplastin time, D dimer and fibrinogen in detection of critical COVID-19

	Cutoff	AUC	95% CI	Sensitivity	Specificity	p-value
PT(Sec)	≥18.35	0.864	0.779 – 0.95	81.8%	78.3%	0.001*
PTT(Sec)	≥34.5	0.856	0.711 – 1	81.8%		0.001*
Fibrinogen g/l	≥4.345	0.923	0.841 – 1	90.9%	81.2%	0.001*
D dimer mg/l	≥0.885	0.793	0.656 – 0.93	81.8%	78.3%	0.001*

AUC: area under curve, * Significant p-value (<0.05), CI: Confidence interval, PT: Prothrombin time, PTT: Partial thromboplastin time

DISCUSSION

In our study the relation between COVID 19 and CBC parameters revealed statistical significant increase of WBCs in critical group than mild group, moreover, the lymphocyte was non-significant decreased with increasing COVID 19 severities, while the hemoglobin and PLTs not differed between studied groups. In contrast, Palladino [6] showed that coronaviruses have prominent effects on hematopoietic system, as in the early stage of the disease the lymphocytes, PLTs, eosinophils, hemoglobin, and basophils represent marked decrease, in critically ill patients. Akbari, et al. [7] reported that in critically ill patients, the neutrophil was increased while lymphocyte was decreased. Neutrophil count and WBCs were non-significantly increased in severe / critical group. On the contrary, a study done by Xu et al. [8], reported significant deficiency in lymphocytes count in severe / critical patients indicates that a- large numbers of lymphocytes are consumed and the immune function is suppressed in these patients. Lymphocytes damage may be dangerous indicator of the disease severity and must be used as a good index in the assessment of deterioration of the disease. In contrast to our study, a study done by Lippi et al [9] confirmed that low PLTs count is a common abnormalities with increased disease severity and mortality in patients with COVID-19 , and thus should be considered a clinical indicator of disease deterioration during hospitalization.

In our study there was significant prolongation of PT, PTT, and INR, with significant increase of D-dimer level and fibrinogen level as the severity of disease increased. As regard increasing coagulopathy in patients with severe COVID-19. Similarly, a study was done by Saurabh et al. [10] demonstrated that severe COVID-19 patients showed significant increase of D-dimer and fibrinogen levels, with prolongation of PT compared to mild and moderate COVID-19 patients. Increasing coagulation profile are predictive of increased disease severity among COVID-19 patients. In agreement with our study, Long et al. [11] study showed that hypercoagulability state was found in COVID 19 infected patients at the early stage of the disease, and is associated with progression of severity and mortality . Thus, the coagulation parameters must be monitored as early as possible to detect thrombotic complications. Accordingly, it is important to give prophylactic anticoagulant therapy to COVID-19 patients in order to prevent increasing risk of thrombosis and disseminated intravascular coagulation (DIC), and to decrease the morbidity and mortality rates. –Gupta et al. [12] demonstrated that in patients with COVID 19, the most frequent laboratory abnormalities include prolonged PTT, PT, increased PLTs count, increased fibrinogen level, three-fold rise in D-dimer levels, and elevated CRP.

In our study the severe and critical groups have significantly higher dyspnea compared to mild and moderate groups, while sore throat was significantly more presented among patients with mild or moderate COVID 19, the cough and fever were non-significantly differed between groups. These results were in agreement with Talukder et al.[13] study which documented that fever was the most frequent symptom in the COVID-19 confirmed cases, followed by fatigue, cough, dyspnea and myalgia. The only symptom, which was accompanying with disease severity is dyspnea and shortness of breath.

Our study showed significant increase of serum ferritin ~~as the~~ with increasing COVID 19 severity, while there was no significant differences between groups regarding ESR and CRP. In agreement, Zeng et al. [14], demonstrated an association of ferritin level with the disease severity. However, this study was against our study regarding ESR and CRP level which was associated with increased-severity of COVID-19.

Our study showed that as the severity of the disease increases the CT findings demonstrated severe lung affection as consolidation patches and GGO increase. These results agreed with the study done by Landete et al. [15], who demonstrated that the most common and

typical manifestation of CT is GGO, with peripheral distribution. GGO are common during the early phase. Speedy progression of lung affection is common and considered as alarming sign to rapid progression of the disease. CT lets us determine the extent of the disease severity, which is associated with clinical state. The presence of extensive lung consolidation indicates a bad prognosis, especially in the old age.

The fair sensitivities and specificities of PT, PTT, D dimer and fibrinogen for determination of COVID-19 severity and for prediction of critical COVID 19 in our study indicate that we can't rely on them for prediction of COVID-19 infection severity, however, they must be taken into consideration along with other markers severity e.g. radiological findings, disturbance of blood gases and inflammatory mediators. Unfortunately, we can't compare these findings with other studies as there is no previous research address this point.

CONCLUSION

Coagulation biomarkers (PT, PTT, fibrinogen and D-dimer) increases in SARS-COV-2 infected patients, and they increased further as the severity of the disease increased. Therefore, these biomarkers can be used as risk factors for severity. Regular follow up of these biomarkers is useful for early detection and management of patients by giving anticoagulant and anti-inflammatory.

Financial support: This work was not funded from any governmental or non-governmental agencies.

Conflict of interest declaration: The authors declared that there is no direct or indirect conflict of interest**.**

REFERENCES

1. **Zhou P, Yang XL, Wang XG, Hu B, Zhang L, Zhang W, et al.** A pneumonia outbreak associated with a new coronavirus of probable bat origin. Nature. 2020; 579 (7798): 270-273.
2. **Andersen KG, Rambaut A, Lipkin WI, Holmes EC, and Garry RF.** The proximal origin of SARS-CoV-2. Nature medicine. 2020; 26(4):450-452.
3. **Campbell RA, Hisada Y, Denorme F, Grover SP, Bouck EG, Middleton EA, et al.** Comparison of the coagulopathies associated with COVID-19 and sepsis. Research and practice in thrombosis and haemostasis. **2021 ;** 5(4), e12525.
4. **Feng Y, Ling Y, Bai T, Xie Y, Huang J, and Li J.** COVID-19 with different severities: A multicenter study of clinical features. Am J Respir Crit Care Me, 2020; 201(11): 1380–1388.
5. **Torres Zambrano G.M, Maher Ahmed Y, Ventura Carmenate Y, and Elsadawy ME .** Stem cell nebulization therapy for COVID-19 infection: radiological and clinical outcomes. Egypt J Radiol Nucl Med, 2021;. 52(115):
6. **Palladino M.** Complete blood count alterations in COVID-19 patients. A narrative review. Biochemia medica **; 2021**, 31(3).
7. **Akbari H, Tabrizi R, Lankarani KB, Aria H, Vakili S, Asadian F, et al.** The role of cytokine profile and lymphocyte subsets in the severity of coronavirus disease 2019 (COVID-19): a systematic review and meta-analysis. Life sciences. 2020 ; 258, 118167.
8. **Xu Z, Shi L, Wang Y, Zhang J, Huang L, Zhang C, et al .** Pathological findings of COVID-19 associated with acute respiratory distress syndrome. The Lancet respiratory medicine ;**2020,** 8(4), 420-422.
9. **Lippi G, Plebani M, Henry BM.** Thrombocytopenia is associated with severe coronavirus disease 2019 (COVID-19) infections: a meta-analysis. Clinica chimica acta, **2020;** 506, 145-148.
10. **Saurabh A, Dey B, Raphael V, Deb P, Khonglah Y, Tiewsoh I, et al**. Role of coagulation profile in predicting disease severity among patients of COVID-19. Cureus. 2021; 13(10)
11. **Long H, Nie L, Xiang X, Li H, Zhang X, Fu X, et al.** D-dimer and prothrombin time are the significant indicators of severe COVID-19 and poor prognosis. Bio Med research international, among patients of COVID-19. Cureus, 2020;13(10).
12. **Gupta A, Madhavan MV, Sehgal K, Nair N, Mahajan S, Sehrawat T S, et al .** Extrapulmonary manifestations of COVID 19. Nature medicine. 2020; 26(7), 1017-1032.
13. **Talukder A, Razu SR, Alif SM, Rahman MA, and Islam SMS.** Association Between Symptoms and Severity of Disease in Hospitalised Novel Coronavirus (COVID-19) Patients: A Systematic Review and Meta-Analysis. Journal of multidisciplinary healthcare.2020; 1101-1110.
14. **Zeng F, Huang Y, Guo Y, Yin M, Chen X, Xiao L, and Deng G.** Association of inflammatory markers with the severity of COVID-19: A meta-analysis. International Journal of Infectious Diseases. 2020; 96, 467-474.
15. **Landete P, Loaiza CAQ, Aldave-Orzaiz B, Muñiz SH, Maldonado A, Zamora E, et al.** Clinical features and radiological manifestations of COVID-19 disease. World Journal of Radiology.2020; 12(11), 247.

الملخص العربي

تخثر الدم المصاحب للإصابة بفيروس كوفيد 19

داليا صابر الدواش[1]، دينا احمد ابراهيم [2]، سميحة محمد ابو بكر[3]، صباح سعد عرابي[3]

[1] قسم الأمراض الصدرية، مستشفى الأحرار التعليمي، الزقازيق، جمهورية مصر العربية.
[2] قسم الباثولوجيا الإكلينيكية، مستشفى الاحرار التعليمي، الزقازيق، جمهورية مصر العربية.
[3] قسم الأمراض الصدرية، كلية طب بنات، القاهرة، جامعة الأزهر، جمهورية مصر العربية.

ملخص البحث

الخلفية: يعاني مرضى كوفيد ١٩ المصابون بعدوى حرجة من اعتلال التخثر، و بالذات التخثر داخل الأوعية الدموية مثل تكوين جلطة ضخمة. وبالتالي، فإن اختبارات التخثر مفيدة للتمييز بين الحالات الشديدة من كوفيد ١٩.

الهدف: تقييم دور زمن البروثرومبين وعدد الصفائح الدموية والفيبرينوجين و دي دايمر للكشف عن اعتلال التخثر في مرضي كوفيد ١٩ وعلاقتهم بشدة المرض.

الطرق: تم إجراء دراسة مستعرضةعلى 80 مريضًا مؤكد تشخيصهم بعدوي الكوفيد ١٩. تم تسجيل الأعراض المرضية، التدخين، الأمراض المصاحبة ونتائج الاشعة المقطعية. كما تم عمل التحاليل التالية لجميع المرضي: صورة دم كاملة، تحليل وظائف الكلى والكبد، غازات الدم، سرعة الترسيب، فيريتين، بروتين سي التفاعلي، والفيبرينوجين و دي دايمر. و تم تقسيم المرضي بناءً على معايير شدة الإصابة بالكوفيد ١٩الي: حالات لديهم عدوي بسيطة ومتوسطة وشديدة وحرجة.

النتائج: من بين المرضي الذين تم دراستهم 33.75 ٪ لديهم عدوى بسيطة، 13.75٪ متوسطة، 38.75٪ شديدة، و 13.75٪ حرجة. كانت صعوبة التنفس شائعة بشكل احصائي في المجموعة الشديدة و الحرجة، بينما كان التهاب الحلق شائعًا احصائيا في المجموعة البسيطة و المتوسطة. كان مستوي الفيريتن أعلى احصائيا في المجموعة الحرجة مقارنة بالمجموعة المتوسطة. المجموعة الشديدة و المجموعة الحرجة لديهم مقياس اشعة مقطعية اعلي احصائيا مقارنة بالمجموعة البسيطة أو المتوسطة. كانت خلايا الدم البيضاء أعلى بكثير في المجموعة الحرجة مقارنة بالمجموعة البسيطة. كان مستوى دي دايمر و الفيبرونجين اعلى بكثير في المجموعة الشديدة والحرجة مقارنة بالمجموعة البسيطة و المتوسطة. زمن البروثرومبين و دي دايمر و الفيبرونجين لديهم حساسية عادلة لتحديد شدة الإصابة في مرضي الكوفيد ١٩.

الاستنتاج: تزداد المؤشرات الحيوية للتخثر لدى المرضى المصابين بكوفيد-19 وتزداد أكثر مع زيادة شدة المرض.

الكلمات المفتاحية : متلازمة الجهاز التنفسي الحادة كوفيد ١٩، تخثر الدم المصاحب للإصابة بفيروس كوفيد١٩، فيبرينوجين، دي دايمر

الباحث الرئيسي
الإسم : داليا صابر أمين الدواش، قسم الأمراض الصدرية بمستشفى الأحرار التعليمي الزقازيق، جمهورية مصر العربية.
الهاتف: 0102379622
البريد الالكترونى: daliaeldawash@gmail.com