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Research Article

Estimation of D-Dimer Level among Sudanese Patients with COVID-19 Infection-Khartoum State 2022

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Abstract

Background: Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) causing coronavirusdisease 2019 (COVID-19) has rapidly evolved from an epidemic outbreak in Wuhan, China into a pandemic infecting more than one million individuals all over the world, where as billions of citizens are affected by measures of social distancing and the socioeconomic impact of the pandemic

Material and methods: This was case control study, conduct at COVID-19 quarantine hospitals in Khartoum state during the period from May to July 2022, for the measurement of D-dimer level among Sudanese covid 19 patients. One hundred participants were selected as cases and apparently fifty participants were selected as control group. 2.8 ml of venous blood samples were collected in Tri Sodium Citrate anticoagulant The D-dimer was performed using B50protein analyzer .

Results: When compared the D-dimer results between case and control there was highly significant difference with p.value 0.000. In addition the D-dimer in cases compared with the other study variables which revealed; significant differences with the chronic disease and the severity of the disease, in significant differences with the age, gender and smoking status.

Conclusion: This study concluded that D-dimer was significantly increase in COVID-19 patients, and it had significant differences with the chronic disease and the severity of the disease, insignificant differences with the age, gender and smoking status.

Keywords: COVID-19, SARS-CoV-2, D-dimer, chronic disease and B50protein analyzer

INTRODUCTION:

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) causing coronavirusdisease 2019 (COVID-19) has rapidly evolved from an epidemic outbreak in Wuhan, China, into a pandemic infecting more than one million individuals all over the world, whereasbillions of citizens are affected by measures of social distancing and the socioeconomic impact of the pandemic. SARS-CoV-2 is approximately 80% similar to SARS-CoV andinvades host human cells by binding to the angiotensin-converting enzyme 2 (ACE2)receptor.1Although it is well documented that COVID-19 is pri marily manifested as arespiratory tract infection, emerging data indicate that it should be regarded as a systemicdisease involving multiple systems including cardiovascular, respiratory, gastrointestinal,neurological, hematopoietic and immune system. [1,2,3]

Coagulopathy observed in severe illness has been linked with high mortality, and patients who died developed disseminated intravascular coagulation (DIC) and it has been hypothesized, based on coagulation laboratory tests. [4] Although hyperfibrinolysis is associated with a doubling of mortality in septic critically ill patients, fibrinolysis shutdown, an acute impairment of fbrinolysis, has also been recognized as a risk factor for increased mortality in these patients.[5,6] Both hyperfbrinolysis and fbrinolysis shutdown can be assessed by thromboelastometry, a viscoelastic test that has been used as point-of-care for bleeding risk and hemostatic therapy guidance in critically-ill patients. Furthermore, its potential role in predicting mortality in septic critically-ill patients has recently been reported. [7,8]

VTE is one of the severe complications identified in critical COVID-19 patients and coagulopathy resulting in VTE and DIC has been reported as the primary cause of death in critical patients.[9] Numerous hemostatic cellular and plasmatic elements interact to trigger inflammatory and immune cascade leading to VTE in the presence of sepsis and acute respiratory distress syndrome (ARDS).[10] Our aim was to describe effect of COVID 19 over coagulation tests. This study was designed to measure the D- dimer level among Sudanese patients with COVID-19 infection.

MATERIAL AND METHOD

This was case control study conduct at COVID-19 quarantine hospitals in Khartoum state during the period from May to July 2022. All Sudanese patients with confirmed covid-19 infection by real time polymerase chain reaction (RT- PCR) and admitted quarantine hospitals in Khartoum state were included as a cases, and apparently healthy participants

without history of bleeding thrombi or under anticoagulant drugs were selected as control group. 2.8 ml of blood samples were gathered in trisodium citrate anticoagulant container for D- dimer measurement. The participants were interviewed with questionnaires; the questions were about demographic data and clinical information along with other data required in the study. Permission to carry out the study was obtaining from ethical committee of collage of medical laboratory science, West Nile Collegeand verbal consent was taken from each participant

Principle of the test:

Is based upon an immunometric flow through principle. The plasma sample is applied to the test well of the device. When the sample has soaked in to the device D-dimer molecules are trapped on a membrane carrying D-dimer specific monoclonal antibodies.

The conjugate solution then was added contains D-dimer specific monoclonal antibody conjugated with ultra-small gold particles.

The D-dimer on the membrane was bind the gold-antibody conjugated in a sandwich-type reaction. The excess conjugate is removed from the membrane by the washing solution.

In the presence of D-dimer levels above 0.1mgL n the sample the membrane appears reddish with color intensity proportional to the D-dimer concentration. The color intensity is evaluated using B50protein analyzer.

Test Procedure

Prewashing; apply 50 ml of washing solution to the test device. Avoid touching the membrane with the pipette. Sample; apply 50 ml undiluted platelet-free citrated plasma or control to the test device. The sample was absorbed into the membrane in less than 50 second. Conjugate; apply 50 ml of conjugate to the test device. The conjugate was absorbed into the membrane in less than 50 second. Washing; apply 50 ml of washing solution to the test device. The positive was used to confirm the efficacy of the reagents and the correct performance of the test. The measured value within the acceptable limits stated on the vial label.

RESULT

Socio- demographic data

In the present study one hundred participants were selected as cases and apparently fifty participants were selected as control group. In the case group about 60% were male and 40% were female, their mean of age was (57.6± 15.6) years. In addition to that about 22% were smoker and 78% were not smoker, for the history of chronic disease about 24% had a history of diabetes mellitus, 15% had history of hypertension and about 41 % hadn't a history of any chronic disease. (Table1, 2)(Figure 1,2,3).

Regarding to the severity of COVID-19 among the case group; about 41% were a moderate cases, 34% severe cases, and 25% were a mild cases. (Table 3) (Figure 4)

Table 1: Sociodemographic data

	Gender	**Frequency**	**Percent**
Case	Male	60	60.0
	Female	40	40.0
	Total	100	100.0
Control	Male	37	74.0
	Female	13	26.0
	Total	50	100.0
Case (Age)			
Minimum	**Maximum**	**Mean**	**Std. Deviation**
26	95	57.6	15.6
Control(Age)			
Minimum	**Maximum**	**Mean**	**Std. Deviation**
23	92	62.9	17.1
Cases	**Smokers**	**Frequency**	**Percent**
		22	22
	Non smokers	**Frequency**	**Percent**
		78	78

Table 2: Distribution of Chronic disease in the case group

Chronic disease	**Frequency**	**Percent**
No	41	41.0
Diabetic	24	24.0
Hypertensive	15	15.0
Asthma	4	4.0
Cardiac disease	9	9.0
CRF	7	7.0
Total	100	100.0

Table 3: Distribution of Severity of disease

Severity of disease	Frequency	Percent
Mild	25	25.0
Moderate	41	41.0
Sever	34	34.0
Total	100	100.0

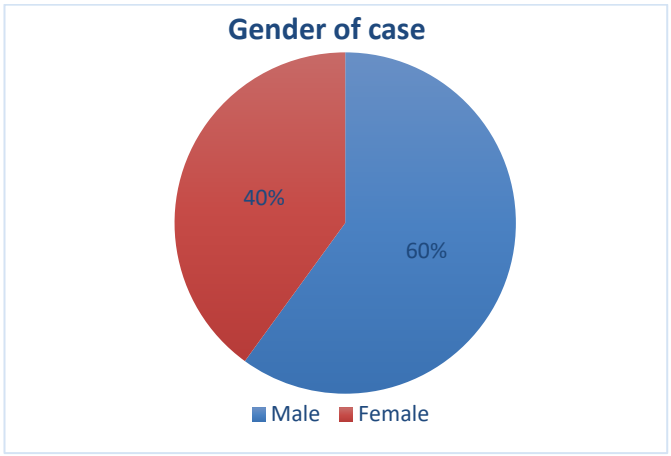

Figure 1: Distribution of Gender

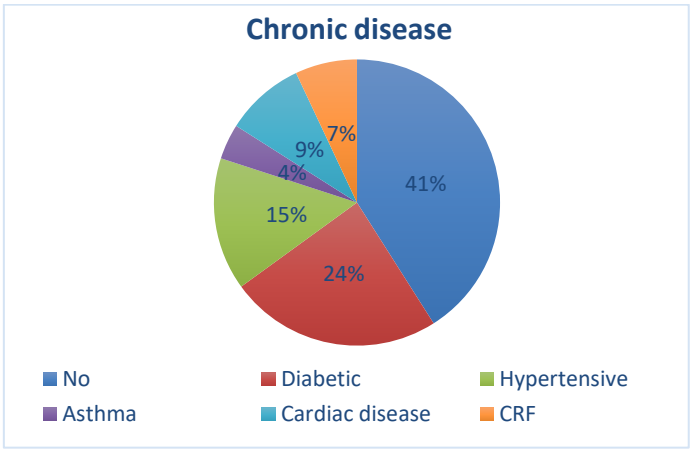

Figure 3: Distribution of Chronic disease

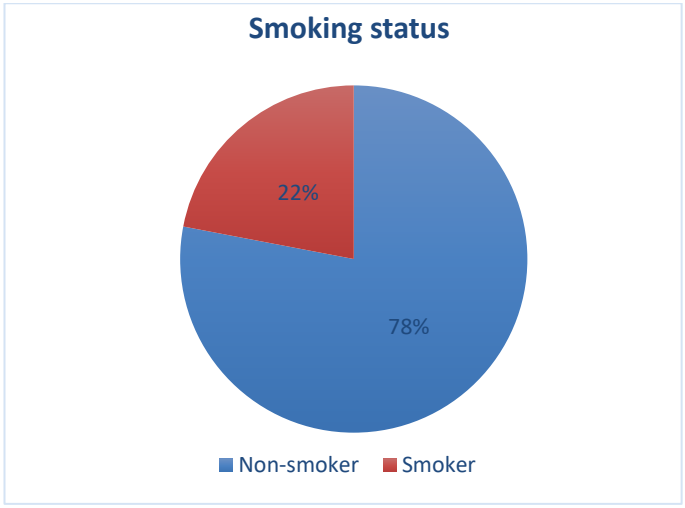

Figure 2: Distribution of Smoking status

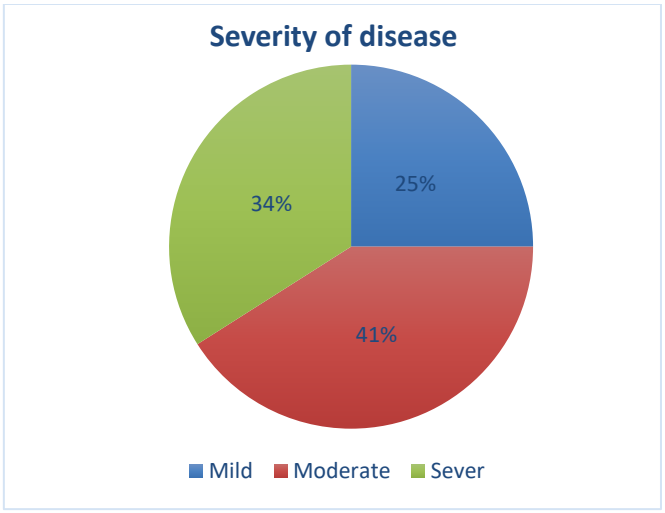

Figure 4: Distribution of severity of the disease

3.1.2 Hematological Result:

The mean of D- dimer in the cases was (8.5± 5.4) while in the control group was (0.3±1) (table 4) (figure 5). When compared the D-dimer mean between case and control group there was highly significant differences (p. v= 0.000) (table 5).

Also the D-dimer in cases compared with the other study variables which revealed; significant differences with the chronic disease and the severity of the disease, in significant differences with the age, gender and smoking status. (Table 6, 7).

Table 4: Mean of D-Dimer in case and control

Variables	N	Minimum	Maximum	Mean	Std. Deviation
Case					
D-Dimer	100	.85	21.10	8.5	5.4
Control					
D-Dimer	50	.14	.51	0.3	0.1

Table 5: Comparison of D-Dimer between case and control

	Study population		P. value
	Case (n=100)	Control (n=50)	
D-Dimer	8.5 ± 5.4	0.33 ± 0.12	0.000*

Table 6: Comparison of D-Dimer according to study variables

Variables		D-Dimer Mean ± SD	P .value
Gender	Male (n=60)	8.7 ± 5.7	0.605
	Female (n=40)	8.1 ± 5.1	
Age	≤ 40 years (n=15)	7.0 ± 5.0	0.465
	40 - 60 years (n=38)	8.3 ± 5.7	
	> 60 years (n=47)	9.0 ± 5.4	
Smoking status	Non-smoker (n=78)	7.9 ± 4.9	0.089
	Smoker (n=22)	10.6 ± 6.7	
Chronic disease	No (n=41)	4.4 ± 2.5	0.000*
	Diabetic (n=24)	8.9 ± 4.2	
	Hypertensive (n=15)	12.2 ± 4.9	
	Asthma (n=4)	11.5 ± 5.0	
	Cardiac disease (n=9)	15.3 ± 5.0	
	CRF (n=7)	11.7 ± 6.3	

Table 7: Comparisons of D-Dimer according to severity of disease

Severity of disease (I)	Severity of disease (II)	D-Dimermean (I)	D-Dimermean (II)	P. value
Mild	Moderate	2.3 ± 0.9	6.7 ± 1.6	0.000*
	Sever		15.0 ± 2.9	0.000*
Moderate	Sever	6.7 ± 1.6	15.0 ± 2.9	0.000*

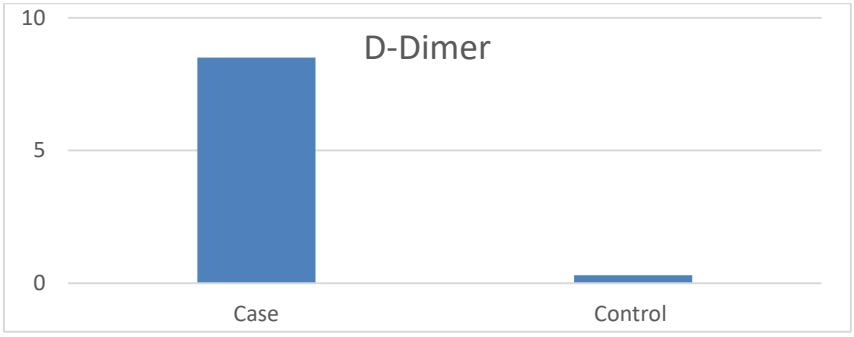

Figure 5: Mean of D-Dimer in case and control

DISCUSSION

A case control study was enrolled, one hundred and fifty individuals were included in our study, one hundred patients with COVID-19 as case group and fifty healthy individuals as control group. In patients with COVID-19 about 60% were male and 40% were female, their mean of age was (57.6± 15.6) years. That agree with Araya S et al study, 455 Covid-19 patients, among the study participants, 289 (63.5%) were males with a mean of 49.9±18.3 years. Also agree with BabakSayad and ZohrehRahimi; the most frequent patients were male (59.4%) with a mean age of 65.1±17.1 years. Also consistent with study conducted by C. Ibañez, et al; Nineteen

patients were included, 53% patients were males and 47%were females with a mean age of 61 years. [11,12,13]

This study revealed that most frequent chronic disease was diabetes mellitus. That conflict with C. Ibañez, et al, showed that most frequent comorbidity was hypertension (47%).[13]

In present study, regarding to the severity of COVID-19 among the case group; about 41% were a moderate cases, 34% severe cases, and 25% were a mild cases. That agree with Araya S et al, from the total 455 study subjects, there were 297 mild cases, 90 severe cases, and 68 critical cases based on disease severity of COVID-19. [11]

In our study, the mean of D- dimer in the cases was (8.5± 5.4) while in the control group was (0.3±1) with highly significant differences (p. v= 0.000), that consistent with BabakSayad and ZohrehRahimi, 2020 which reported; The mean level of D-dimer was increased in patients with COVID-19 (5.1±7.3) (0.1-25) µg/ml. [12] Also agree with C. Ibañez, et al, 2020; D-dimer levels were 6.2 (4.8–7.6 g/L), 1000 (600–4200 ng/ml).[13] That corresponding with Thiago DomingosCorrêa, et al, 2020, D-dimer plasma levels were higher than normal reference range.**[14]** Franklin L Wright, et al, 2020, showed elevated in D-dimer level.[15] Also another study conducted by Islam Eljilany and Abdel-NaserElzouki, 2020, revealed D-dimer was elevated.[16] In another study conducted by Lili Luo et al, 2020, D-dimer levels were significantly elevated in COVID19 patients. That agree with study of Guan et al, 2020, presented with elevated D-dimer more frequently (p=0.002). Also agree with EvangelosTerpos, et al, 2020, elevated D-Dimer levels are consistently reported .But conflict with Rongrong Ding, *et al*. 2021, that present of normal D-dimer.[17,18,19,20]

CONCLUSION

This study concluded that D-dimer was significantly increase in COVID-19 patients, and it had significant differences with the chronic disease and the severity of the disease, insignificant differences with the age, gender and smoking status.

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