Does Early Initiation of Anticoagulant Therapy Minimize The Need for Maternal Respiratory Support in COVID-19 Positive Pregnant Women

Original Article

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ABSTRACT

Background: Thrombosis is an undeniable outcome of COVID-19 with substantial prognostic implications. Patients with severe COVID-19 infection might have a better prognosis when treated with anticoagulant therapy such as low molecular weight heparin (LMWH). Given the paucity of studies on anticoagulant prophylaxis in COVID-19 pregnant women, this study aimed to determine the association between the timing of the anticoagulant therapy and the need for maternal respiratory support.

Patients and Methods: This retrospective cohort study was conducted at Masr El Gedida Military Hospital on 100 pregnant women with confirmed COVID-19 infection from March of 2020 to December of 2021. Patients who started the anticoagulant early were included in group A, whereas patients who started the anticoagulants later, after progression to moderate or severe respiratory symptoms, were included in group B. Women in both groups had been followed through their medical records and investigations for the development of respiratory complications and pregnancy outcomes.

Results: The median oxygen saturation in group B (90%) was significantly lower than in group A (94%), *P-value < 0.001*. A significantly higher percentage of group B (52.4%) had oxygen therapy when compared to group A (12.7%) *P-value < 0.001*. Furthermore, group B had a significantly higher percentage of maternal deaths (9.5%) than group A (0%), with a *P-value* of *0.006*.

Conclusion: Anticoagulant medication started early rather than late in the course of a COVID-19 infection in a pregnant woman might reduce the requirement for maternal respiratory support.

Key Words: Anticoagulant, COVID-19, maternal respiratory support, pregnancy.

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INTRODUCTION

Indeed, thrombosis has been identified as a common complication of COVID-19 with pivotal prognostic considerations[1]. Both venous thromboembolic and arterial events have been found more often in COVID-19 than in other viral infections.[2,3]. At least two processes are responsible for these events: pulmonary microvascular thrombosis (immune-thrombosis) and hospital-acquired venous thromboembolism (VTE)[4]. While pregnancy does not seem to enhance susceptibility to severe acute respiratory syndrome coronavirus 2 infection, it does appear to aggravate the clinical course of COVID-19[5,6]. Increased prothrombotic factors are hallmarks of pregnancy, which is also associated with reduced protein S and altered fibrinolysis, particularly during the peripartum period[7]. In a Dutch study, 31% of pregnant females with COVID-19 pneumonia had some kind of thromboembolism in their veins or arteries (acute pulmonary embolism, deep vein thrombosis, or myocardial infarction)[8]. The risk of maternal VTE, intensive care unit (ICU) admission, and hospitalization was higher among pregnant women with a COVID-19 infection[9]. The COVID-19 infection was associated with increased preterm birth and cesarean delivery rates[5] and the higher risk appears to be restricted to patients with severe disease[10]. Low molecular weight heparin has been the cornerstone of prophylactic anticoagulation in COVID-19 thanks to its anti-inflammatory and immunomodulatory characteristics, as well as its predictable absorption, with recent evidence showing patients with severe COVID-19 treated with LMWH had a better prognosis[11,12].

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PATIENTS AND METHODS:

Research design and setting:

This retrospective cohort study was conducted between March 2020 and December 2021, at the Obstetrics and Gynecology department of Masr El Gedida Military Hospital.

Participants

Pregnant women with confirmed COVID-19 in Masr El Gdida Military Hospital in the period between March 2020 and December 2021. The inclusion criteria were adult pregnant women aged 18 to 37 who got infected with COVID-19 during pregnancy with full medical records. Exclusion criteria were: pregnant women with a medical history suggestive of thrombophilia, antiphospholipid syndrome, thromboembolic disease, or any cause of VTE. Also, pregnant women with an obstetric history of preterm birth due to pre-eclampsia or fetal growth restriction were excluded, as were women with any contraindications to thromboprophylaxis.

Data Collection

Records of subjects were retrieved, along with their follow-up sheets and laboratory findings, from the lab archive (including the polymerase chain reaction swab for COVID-19). The records were stratified into two groups: Group A included those in whom anticoagulation therapy was started early in the course of the disease (with no or mild respiratory symptoms), and Group B included those in whom anticoagulation therapy was started late in the course of the disease (after progression to moderate or severe respiratory symptoms). Women in both groups had been followed through their medical records for the development of respiratory complications and pregnancy outcomes. Maternal data collected included maternal age, gravidity, parity, and gestational age at delivery. Laboratory tests included CBC, serum alanine transaminase (ALT), and aspartate aminotransferase (AST), kidney function tests, a coagulation profile, inflammatory markers, and other lab tests. Moreover, chest X-ray reports were retrieved.

The retrieval of pregnancy outcomes included mode of delivery and maternal complications of COVID-19 infection, including the requirement of oxygen therapy, invasive mechanical ventilation, and intensive care unit (ICU) admission. Neonatal outcomes such as birth weight, APGAR score, neonatal intensive care unit (NICU) admission, and NICU length of stay were also retrieved. The main outcome was to determine the association between the timing of the anticoagulant therapy and the need for maternal respiratory support.

Statistical analysis

Data were entered into a Microsoft Excel spreadsheet for Windows and analysed with SPSS version 26 (**IBM Corp. Released 2019. IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp**). Categorical variables were presented as frequency (n) and percentage (%) and analysed using the chi-square test. Whereas as quantitative variables were presented as mean, standard deviation (SD), median and interquartile range (IQR). Nonparametric data were analysed with the Mann-Whitney U test. A level of significance of 5% was set for all statistical analyses ($\alpha = 0.05$).

Ethical considerations

The study proposal was approved by the Armed Forces College of Medicine Ethical Review Committee (IRB: 37; meeting: September 25, 2021; serial number: 61). Written informed consent was obtained from patients in the study. The study was conducted in accordance with the Revised Helsinki Declaration on Biomedical Ethics. The data confidentiality policy was properly adhered to.

RESULTS:

One hundred pregnant women with confirmed COVID-19 infection were included in this retrospective cohort study at Masr El Gdida Military Hospital. There was no statistically significant difference between group A and group B regarding age (*P > 0.05*). Moreover, parity and gestational age at infection were significantly higher in group B compared to group A (*P-values = 0.001* and *0.017*, respectively). (Table 1).

Table 1: Basal characteristics between pregnant COVID-19 women treated with anticoagulant early and late

	Group (A) Early (N=79)					Group (B) Late (N=21)					Mann-Whitney U test	
	Mean	SD	Median	Range		Mean	SD	Median	Range		Test value	*P-value*
Age (years)	29.15	7.04	32.00	18.00	37.00	34.67	1.00	34.00	34.00	36.0	1.953	*0.051*
Parity	2.02	.970	2.00	.000	3.00	3.00	.00	3.00	3.0	3.0	3.297	*0.001*
GA at infection	25.85	10.01	32.00	10.00	38.00	35.00	2.29	36.00	29.00	36.00	2.932	*0.017*

P-value<0.05: significant; *P-value<0.01*: highly significant; **SD:** Standard deviation; **GA:** Gestational age

There was no significant difference between group A and group B regarding symptoms (*P > 0.05*).

Table 2: Comparison between pregnant COVID-19 women treated with anticoagulant early and late

Parameters		Group (A) Early (N=79)		Group (B) Late (N=21)		Chi-Square test	
		No.	%	No.	%	X^2	*P-value*
Symptoms	Asymptomatic	18	22.8%	5	23.8%	0.037	*0.847*
	Symptomatic	61	77.2%	16	76.2%		

P-value≤0.05: statistically significant; *p-value≤0.01*: high statistically significant; X2: Pearson Chi-Square test.

Group A and Group B had similar heart rates (*P > 0.05*). However, group B had a considerably higher respiratory rate than group A (*P < 0.001*). The median oxygen saturation in group B (90%) was significantly lower than in group A (94%), (*P-value < 0.001*). (Table 3)

Table 3: Vital signs between pregnant COVID-19 women treated with anticoagulant early and late

	Group (A) Early (N=79)					Group (B) Late (N=21)					Mann-Whitney U test	
	Mean	SD	Median	Range		Mean	SD	Median	Range		Test value	*P-value*
Heart Rate (beats/ minute)	93.68	7.24	98.00	78.00	99.00	97.67	1.00	97.00	97.00	99.00	0.234	*0.815*
Respiratory Rate (breath/minute)	38.57	3.48	39.00	32.00	45.00	43.00	1.50	42.00	42.00	45.00	4.013	*<0.001*
Oxygen saturation	93.56	2.81	94.00	87.00	97.00	89.00	1.50	90.00	87.00	90.00	4.004	*<0.001*

P-value<0.05: significant, *P-value<0.01*: highly significant, SD: Standard deviation

There was no significant difference between group A and group B in terms of red cell count (*P-value > 0.05*). Meanwhile, there was significantly lower level of hemoglobin, white blood cells, platelets, neutrophils, and lymphocytes in group B compared to group A (*P-values* = 0.006, 0.004, 0.01, 0.001, and 0.001, respectively). (Table 4)

Table 4: Blood count parameters between pregnant COVID-19 women treated with anticoagulant early and late

	Group (A) Early (N=79)					Group (B) Late (N=21)					Mann-Whitney U test	
	Mean	SD	Median	Range		Mean	SD	Median	Range		Test value	*P-value*
Hemoglobin (gm/Dl)	13.40	.90	14.00	12.20	14.00	12.04	1.95	11.90	9.90	16.10	2.770	*0.006*
White blood cells (10^3/L)	9640.61	10503.90	7896.0	3800.0	76857.0	5400.0	2400.0	3800.0	3800.0	8600.0	2.884	*0.004*
Red cell count	4.74	.45	4.90	4.00	5.30	4.77	.10	4.70	4.70	4.90	0.761	*0.446*
Platelets (10^9/L)	215.93	62.25	213.0	131.0	324.0	172.0	61.50	131.0	131.0	254.0	2.580	*0.010*
Neutrophil	3.42	.92	3.20	2.10	5.10	2.10	.00	2.10	2.10	2.10	4.306	*<0.001*
Lymphocyte	3.20	1.19	3.60	.90	4.70	1.03	.10	1.10	.90	1.10	3.983	*<0.001*

P-value<0.05: significant; *P-value<0.01*: highly significant; SD: standard deviation.

There was no statistically significant difference between group A and group B regarding AST and ALT (*P > 0.05*). Meanwhile, globulin and albumin were significantly higher in group B compared to group A *(P values = 0.017* and 0.003, respectively). On the other hand, serum creatinine and urea nitrogen were significantly increased in group B compared to group A (*P values = 0.002* and *0.003*, respectively). (Table 5)

Table 5: Serum investigations between pregnant COVID-19 women treated with anticoagulant early and late

	Group (A) Early (N=79)					Group (B) Late (N=21)					Mann-Whitney U test	
	Mean	SD	Median	Range		Mean	SD	Median	Range		Test value	*P-value*
Globulin (g/L)	44.52	7.26	46.00	31.00	54.00	38.00	6.00	34.00	34.00	46.00	2.391	*0.017*
Albumin (g/L)	34.98	7.81	34.00	20.00	47.00	25.33	8.00	20.00	20.00	36.00	2.953	*0.003*
AST (IU/L)	39.64	11.40	39.00	12.00	55.00	41.67	18.50	54.00	17.00	54.00	0.761	*0.447*
ALT (IU/L)	31.83	8.33	34.00	16.00	65.00	50.33	22.00	65.00	21.00	65.00	1.758	*0.079*
Serum creatinine (mg/dl)	1.24	.43	1.10	.89	2.30	1.77	.40	1.50	1.50	2.30	3.025	*0.002*
Urea nitrogen (mmol/L)	7.13	1.81	6.80	4.80	10.20	9.53	.50	9.20	9.20	10.20	3.006	*0.003*

P value< 0.05: significant, *P value< 0.01*: highly significant, SD: standard deviation.

Prothrombin time, international normalized ratio (INR), D-dimer, and fibrinogen were significantly higher in group B compared to group A. On the other hand, APTT was significantly decreased in group B compared to group A (*P-value < 0.001*). (Table 6)

Table 6: Coagulation profile between pregnant COVID-19 women treated with anticoagulant early and late

	Group (A) Early (N=79)					Group (B) Late (N=21)					Mann-Whitney U test	
	Mean	SD	Median	Range		Mean	SD	Median	Range		Test value	*P-value*
Prothrombin time	20.00	2.92	19.00	17.00	26.00	22.33	2.00	21.00	21.00	25.00	3.161	*0.002*
INR	1.13	.15	1.10	1.00	1.70	1.57	.20	1.70	1.30	1.70	4.663	*<0.001*
APTT	33.80	4.63	34.00	24.00	39.00	24.67	.50	25.00	24.00	25.00	4.014	*<0.001*
D-dimer (ng/ml)	1.69	1.49	1.10	.90	5.70	4.43	.95	3.80	3.80	5.70	4.074	*<0.001*
Fibrinogen (g/L)	5.16	.92	5.00	4.00	7.20	5.67	.50	6.00	5.00	6.00	2.145	*0.032*

P-value < 0.05: significant; *P-value < 0.01*: highly significant; SD: standard deviation.

As shown in (Table 7), LDH, c-reactive protein, and ferritin were significantly higher in group B compared to group A (*P-value < 0.001*).

Table 7: Serum inflammatory markers between pregnant COVID-19 women treated with anticoagulant early and late

	Group (A) Early (N=79)					Group (B) Late (N=21)					Mann-Whitney U test	
	Mean	SD	Median	Range		Mean	SD	Median	Range		Test value	*P-value*
LDH (u/l)	388.43	193.46	412.00	176.00	870.00	670.00	150.00	570.00	570.00	870.00	3.984	*<0.001*
c-reactive protein (mg/L)	27.48	24.69	20.00	8.00	96.00	69.33	20.00	56.00	56.00	96.00	3.993	*<0.001*
Ferritin (ng/mL)	778.25	324.64	678.00	498.00	2111.00	1818.67	438.50	2111.00	1234.00	2111.00	4.567	*<0.001*

P value< 0.05: significant; *P value< 0.01*: highly significant; SD: standard deviation

As shown in (Figure 1), there was a statistically significant difference between group A and group B regarding chest X-ray findings (*P-value = 0.02*). (Table 8).

Table 8: Radiological findings between pregnant COVID-19 women treated with anticoagulant early and late

Parameters		Group (A) Early (N=79)		Group (B) Late (N=21)		Chi-Square test	
		No.	%	No.	%	X2	*P-value*
Chest X-ray	normal	38	48.1%	16	76.2%	7.79	*0.020*
	ground glass appearance	21	26.6%	5	23.8%		
	pneumonia	20	25.3%	0	0.0%		
Ultrasonography	normal	91	100.0%	9	100.0%		

p≤0.05: statistically significant; *p≤0.01*: high statistical significance; X2: Pearson Chi-Square test

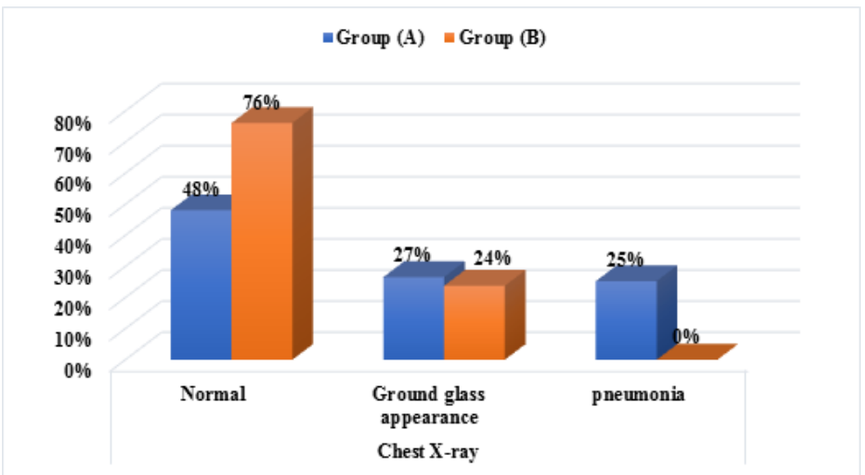

Fig. 1: Chest X-ray findings between pregnant COVID-19 women treated with anticoagulant early and late

Significantly higher percentage of group B (52.4%) had oxygen therapy when compared to group A (12.7%) (*P-value* < *0.001*). Moreover, there were statistically significant differences between group A and group B regarding hospitalization, medical floor, ICU admission, and treatment, as they were significantly higher in group B. (Table 9)

Table 9: Management lines between pregnant COVID-19 women treated with anticoagulant early and late

Parameters		Group (A) Early (N=79)		Group (B) Late (N=21)		Chi-Square test	
		No.	%	No.	%	X^2	*P-value*
Hospitalization	No	69	87.3%	10	47.6%	15.78	*<0.001*
	Yes	10	12.7%	11	52.4%		
Medical floor	No	75	94.9%	16	76.2%	7.12	*0.008*
	Yes	4	5.1%	5	23.8%		
ICU	No	73	92.4%	15	71.4%	6.91	*0.009*
	Yes	6	7.6%	6	28.6%		
Treatment given	antibiotic therapy, corticosteroids, and LMWH	36	45.6%	10	47.6%	8.19	*0.017*
	Antibiotic therapy, corticosteroids, antivirals, and LMWH	6	7.6%	6	28.6%		
	antibiotic therapy, symptomatic treatment LMWH	37	46.8%	5	23.8%		
Oxygen therapy	No	69	87.3%	10	47.6%	15.78	*<0.001*
	Yes	10	12.7%	11	52.4%		

P ≤ 0.05: statistically significant, *p ≤ 0.01*: high statistical significance, X2: Pearson Chi-Square test

There was a high statistically significant difference between the two studied groups regarding ventilation (*P-value < 0.001*), as 10 cases in group B (47.6%) needed ventilation while none of the cases in group A needed ventilation. (Table 10)

Table 10: Need for ventilation between pregnant COVID-19 women treated with anticoagulant early and late

Parameters		**Early Group (A) (N=79)**		**Late Group (B) (N=21)**		**Test value**	*P-value*
		No.	**%**	**No.**	**%**		
Ventilation	**No**	79	100.0%	11	52.4%	X2=41.8	*<0.001*
	Yes	0	0.0%	10	47.6%		

P ≤ 0.05: statistically significant, *p≤0.01*: high statistical significance, X2: Pearson Chi-Square test

As shown in (Table 11), there was a statistically significant difference between group A and group B regarding hospital stay, as it was significantly higher in group B (*p < 0.001*).

Table 11: Hospital stay between pregnant COVID-19 women treated with anticoagulant early and late

Parameters No.		Early Group (A) (N=79)		Late Group (B) (N=21)		Test value	*P-value*
		%	No.	%			
Hospital stay (days)	No	69	87.3%	10	47.6%	X2=48.11	*<0.001*
	7 days	4	5.1%	5	23.8%		
	15 days	6	7.6%	6	28.6%		
	Mean ± SD	13.0± 3.62		9.67± 4.0			
	Median	15.0		7.0		^{Z}MWU=0.062	*0.111*
	Range	7.0- 15.0		7.0- 15.0			

p≤0.05: statistically significant; *p≤0.01*: high statistically significant; X2: Pearson Chi-Square test; ZMWU: Mann-Whitney U test.

In terms of maternal death, group B had a statistically significant higher percentage of maternal death (9.5%) compared with group A (0%) (*p = 0.006*). (Table 12) and (Figure 2)

Table 12: Maternal death between pregnant COVID-19 women treated with anticoagulant early and late

Parameters		Early Group (A) (N=79)		Late Group (B) (N=21)		Test value	*P-value*
		No.	%	No.	%		
Maternal death	No	79	100.0%	19	90.5%	X2=7.68	*0.006*
	Yes	0	0.0%	2	9.5%		

p≤0.05 is considered statistically significant, *p≤0.01* is considered high statistically significant, X2: Pearson Chi-Square test

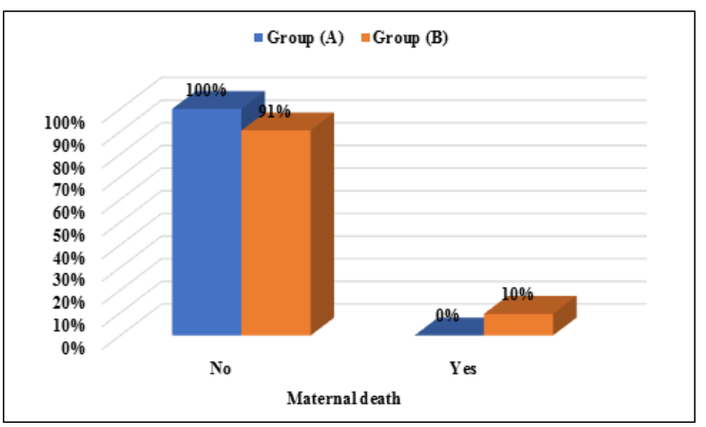

Fig. 2: Comparison between pregnant COVID-19 women treated with anticoagulant early and late

There was a statistically significant difference between group A and group B regarding pregnancy outcome, as in group B, 9.5% had intrauterine fetal demise and intrauterine growth restriction, 19% had preterm labour and 9.5% of them had preterm labour and premature rupture of membranes (*p < 0.001*). (Table 13)

Table 13: Pregnancy outcome between pregnant COVID-19 women treated with anticoagulant early and late

Parameters		Early Group (A) (N=79)		Late Group (B) (N=21)		Test value	*P-value*
		No.	%	No.	%		
Pregnancy outcome	Continued	69	87.3%	11	52.4%	X2=26.16	*<0.001*
	Antepartum hemorrhage	1	1.3%	0	0.0%		
	Intrauterine fetal demise	0	0.0%	2	9.5%		
	Intrauterine growth restriction	5	6.3%	2	9.5%		
	preterm labour	0	0.0%	4	19.0%		
	preterm labour and premature rupture of membranes	4	5.1%	2	9.5%		

p≤0.05: statistically significant; *p≤0.01*: high statistically significant; X2: Pearson Chi-Square test

Significantly higher percentage of COVID-19 pregnant women continued their pregnancy in group A (87.3%) as compared with group B (52.4%) *p-value < 0.001*. (Table 14)

Table 14: Delivery characteristics between pregnant COVID-19 women treated with anticoagulant early and late

Parameters		Early Group (A) (N=79)		Late Group (B) (N=21)		Test value	*P-value*
		No.	%	No.	%		
Mode of delivery	Elective CS	54	68.4%	12	57.1%	X2=22.34	*<0.001*
	Emergency CS	10	12.7%	9	42.9%		
	NVD	15	19.0%	0	0.0%		
GA at delivery (weeks)	Mean± SD	35.83± 5.09		33.86± 5.67		ZMWU=3.690	*<0.001*
	Median	38.0		36.0			
	Range	21.0- 38.0		21.0- 36.0			

p≤0.05: statistically significant; *p≤0.01*: highly statistically significant; X2: Pearson Chi-Square test; ZMWU: Mann-Whitney U test.

The rate of positive viral status was significantly higher in group B compared to group A, at 28.6% and 6.3%, respectively (*p-value = 0.012*). There was a statically significant decrease in APGAR score and birth weight in group B compared to group A (*p < 0.001*). There was no significant difference between the two groups regarding NICU (*p > 0.05*). (Table 15)

Table 15: Neonatal outcomes between pregnant COVID-19 women treated with anticoagulant early and late

Parameters		Early Group (A) (N=79)		Late Group (B) (N=21)		Test value	*P-value*
		No.	%	No.	%		
Birth	Live birth	70	88.6%	15	71.4%	X2=3.84	*0.050*
	Stillbirth	9	11.4%	6	28.6%		
APGAR score (1 minute)	Mean ± SD	8.62± 0.56		7.0± 0.0		ZMWU=4.55	*<0.001*
	Median	9.0		0.0			
	Range	7.0- 9.0		7.0- 7.0			
APGAR score (5 minutes)	Mean ±SD	9.62± 0.56		8.0± 0.0		ZMWU=4.55	*<0.001*
	Median	10.0		8.0			
	Range	8.0- 10.0		8.0- 8.0			
Birth weight (grams)	Mean ± SD	3116.64± 234.1		2357.14± 113.4		ZMWU=4.25	*<0.001*
	Median	3213.0		2400.0			
	Range	2400.0- 3456.0		2100.0- 2400.0			
Viral status	Negative	74	93.7%	15	71.4%	X2=1.27	*0.012*
	Positive	5	6.3%	6	28.6%		
NICU	No	66	83.5%	16	76.2%	X2=0.608	*0.436*
	Yes	13	16.5%	5	23.8%		

P-value≤0.05: statistically significant; *p-value≤0.01*: high statistically significant; X2: Pearson Chi-Square test; ZMWU: Mann-Whitney U test.

DISCUSSION

Thromboembolism is five times more likely to develop in pregnant women due to the hypercoagulability that may occur during pregnancy compared to the general population. It has also been suggested that the severe acute respiratory syndrome coronavirus 2 is linked to an increased risk of coagulopathy[13]. The National Institutes of Health COVID-19 treatment guidelines advise giving a prophylactic dosage of anticoagulation to pregnant women hospitalized with severe COVID-19. Doing so decreases the possibility of blood clots forming, with the goal of preventing VTE. Both the risk of bleeding and the potential advantages of VTE prevention must be considered for each individual patient[14]. A study found that treating severe COVID-19 infections with LMWH resulted in a significantly better prognosis among the patients[12]. Some experts advise that pregnant women with a moderate or severe illness, or a mild disease with VTE risk factors, should continue taking their prophylactic anticoagulant treatment[13].

In our study, the age of the studied women ranged from 18 to 37 years, with a mean age of 26.71 years. Whereas in the study of **Chandra *et al.***[16], age varied from 19 to 37, with a mean of 26 years. The current study showed that the mean respiratory rate was 38.99 per minute and the mean oxygen saturation was 93%. Between groups A and B, there was no significant difference in heart rate. Group B also had a considerably greater respiratory rate than group A did. However, in comparison to group A, O2 saturation was considerably lower in group B. Whereas in the study of **Koyuncu *et al.***[17], the results revealed hypoxia in 2 patients among the total group of 18 pregnant women with COVID-19. Also, **Chen *et al.***[18] revealed that 92% had mild disease, and 8% had severe disease (hypoxia). In our study, group B had considerably greater prothrombin time, INR, D-dimer, and fibrinogen levels than group A did. However, in comparison to group A, APTT was considerably lower in group B. In the study of **Koyuncu *et al.***[17], COVID-19 was found in 18 pregnant women, and 11 of them had abnormally high amounts of the protein D-dimer. Seven of the patients did not receive LMWH. Eight of the eleven people with elevated D-dimer levels started using LMWH.

In the study, all women tested positive for COVID-19. Out of 100 women, 21% women needed hospitalization with 9% women in medical floor while 12% of them needed ICU. Those women (21%) needed oxygen therapy. There was a significant difference between the two groups that were evaluated with respect to ventilation, as all of the cases in group B (16.4%) required ventilation but none of the patients in group A did.

Chest X-ray results in the current study showed that more than half women (54%) had ground glass appearance, 20% women had pneumonia while 26% women had normal chest X-ray. In the study of **Koyuncu *et al.***[17], only 4 of the 18 patients had X-rays of their lungs taken, and of those 4, only 2 exhibited evidence of significant involvement, while the other 2 had normal lung imaging. Also, **Chen *et al.*** [18] demonstrated that 88 out of a total of 111 women (79%) who received a chest CT found infiltrates in both lungs.

COVID-19 is associated with a higher risk of severe sickness, hospitalization, admission to the intensive care unit (ICU), invasive mechanical ventilation, preeclampsia, and mortality in pregnant women as compared to women who are not pregnant. Moreover, a higher risk of preterm birth, stillbirth, cesarean delivery, or treatment in a neonatal critical care unit has been associated with COVID-19 infection in pregnant women as well[19,20].

The present study revealed a significant difference between group A and group B regarding pregnancy outcome, as in group B, 22.2% had intrauterine fetal demise, 11.1% had preterm labour and 66.7% of them had preterm labour and premature rupture of membranes. Our results showed that the rates of stillbirth, positive viral status, and NICU were significantly higher in group B compared to group A. Whereas in the study of **Chen *et al.***[18], fourteen (14% of total) preterm births occurred, and eight of them were induced. Neither the mother nor her newborns passed away.

There is inadequate evidence to support the use of LMWH in pregnant women with COVID-19, since doing so may increase bleeding risk without reducing thrombotic risk. However, information on the value of low-dose aspirin for thromboprophylaxis is scarce. These questions need to be addressed through clinical testing[4].

Limitations of the study

The small sample size and the retrospective study design. Future investigations should be in the form of a randomized clinical trial to acquire more definitive conclusions regarding the role of anticoagulant medication in reducing the need for respiratory support among COVID-19 pregnant patients.

CONCLUSION

Anticoagulant medication started early in the course of a COVID-19 infection in a pregnant woman might reduce the requirement for maternal respiratory support

in comparison with anticoagulant started late, however, future multicenter clinical trial is required to confirm this.

LIST OF ABBREVIATIONS

ALT: alanine transaminase

APTT: activated partial thromboplastin time

AST: aspartate aminotransferase

COVID-19: coronavirus disease of 2019

ICU: intensive care unit

INR: international normalized ratio

LMWH: low molecular weight heparin

NICU: neonatal intensive care unit

VTE: venous thromboembolism

CONFLICT OF INTEREST

There are no conflicts of interest.

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