Original Article / Özgün Makale

MEDICINE PALLIATIVE CARE

DOI: 10.47582/jompac.1208244

J Med Palliat Care 2022; 3(4): 347-353

Exploring clinical and laboratory findings and treatment outcomes in pregnant inpatients with COVID-19: a single-center experience

COVID-19 tanısıyla yatarak izlenen gebe hastalarda klinik, laboratuvar bulguları ve tedavi sonuçlarının değerlendirilmesi

Metin Özsoy, Fatma Şebnem Erdinç, Salih Cesur, Günay Tuncer Ertem, Çiğdem Ataman Hatipoğlu, Sami Kınıklı

Ankara Training and Research Hospital, Department of Internal Medicine, Ankara, Turkey

Cite this article as: Özsoy M, Erdinç FŞ, Cesur S, Ertem GT, Ataman Hatipoğlu Ç, Kınıklı S. Exploring clinical and laboratory findings and treatment outcomes in pregnant inpatients with COVID-19: a single-center experience. J Med Palliat Care 2022; 3(4): 347-353.

ABSTRACT

Aim: The literature seems to miss the clinical course of COVID-19 infection among the pregnant and its effects on the fetus. The present study aimed to evaluate a total of 21 pregnant inpatients in Ankara Training and Research Hospital with the diagnosis of COVID-19 in terms of symptoms, physical examination findings, laboratory findings, treatment results, and complications.

Material and Method: A total of 21 pregnant patients diagnosed with COVID-19 by reverse transcriptase polymerase chain reaction (RT-PCR) in Ankara Training and Research Hospital between 22.04.2020 and 27.09.2021 were included in the study. The clinical symptoms, physical examination findings, laboratory findings, and treatment outcomes of the patients, and the health status of the pregnant and newborn were retrospectively evaluated.

Results: Of the 21 pregnant patients, 10 were Turkish citizens, and 11 were foreign nationals. The patients were aged 20-41 years with a mean age of 28.76 years. All patients were unvaccinated. Considering underlying diseases among the patients, it was found that one patient had hypertension, and one patient had thyroid disease. In order of frequency, the symptoms in the patients were cough (n =10), fatigue (n=8), sore throat (n=6), dyspnea (n=5), fever (n=3), myalgia (n=3), joint pain (n=1), and diarrhea (n=1). Physical examinations of the patients yielded a fever of 37.4 °C above in 3 patients and rales in one patient. Although one patient with COVID-19 pneumonia was followed up in the intensive care unit, all were discharged upon recovery. Chloroquine tablets were started in 6 patients, a combination of ritonavir (50 mg) and lopinavir (200 mg) in 4 patients, and favipiravir in one patient. Cesarean section was performed in 9 patients, while 12 patients gave normal delivery.

Conclusion: Overall, the clinical course of COVID-19 infection in the pregnant followed up in this study was mild, and all newborns were healthy except for one. It is thought that close follow-ups for the pregnant are needed to minimize complications that may develop in them and their fetuses due to COVID-19 infection. Finally, the COVID-19 vaccine seems to be a must for the pregnant to prevent all possible COVID-related complications.

Keywords: COVID-19, pregnancy, newborn, clinical follow-up

This study was presented as an oral presentation at the 9th BUHASDER Congress (November 24–28, 2021 - Antalya).

ÖZ

Amaç: Gebelerde COVID-19 infeksiyonunun klinik seyri ve fetüse olan etkilerine ilişkin sınırlı sayıda çalışma mevcuttur. Bu çalışmada, Ankara Eğitim ve Araştırma Hastanesinde, COVID-19 tanısıyla yatarak izlenen toplam 21 gebe hastanın semptomlar, fizik muayene bulguları, laboratuvar bulguları, tedavi sonuçları ve komplikasyonlar açısından değerlendirilmesi amaçlandı.

Gereç ve Yöntem: Çalışmaya 22.04.2020 ile 27.09.2021 tarihleri arasında Ankara Eğitim ve Araştırma hastanesinde COVID-19 tanısı revers transkriptaz Polimeraz zincir reaksiyonu (RT-PZR) ile konan toplam 21 gebe hasta dahil edildi. Hastaların semptomları, fizik muayene bulguları,laboratuvar bulguları, uygulanan tedavi sonuçları, gebe ve yenidoğanın sağlık durumları retrospektif olarak değerlendirildi.

Bulgular: Çalışmaya dahil edilen 21 gebe hastanın 10'u Türk vatandaşı, 11'i ise yabancı uyruklu bireylerden oluşmaktaydı. Gebelerin yaş aralığı 20-41 yıl arasında, yaş ortalaması 28,76 idi. Gebelerin tamamı aşısızdı. Gebe hastalarda altta yatan hastalıklar değerlendirildiğinde; bir hastada hipertansiyon, 1 hastada tiroid hastalığı mevcuttu. Gebe hastalarda görülen semptomlar sıklık sırasıyla; öksürük (n=10), halsizlik (n=8), boğaz ağrısı (n=6), dispne (n=5) , ateş (n=3), miyalji (n=3), eklem ağrısı (n=1), ve ishaldi (n=1) . Fizik muayenede; 3 hastada 37.4°C üzerinde ateş, bir hastada ise raller mevcuttu. Gebe hastaların biri COVID-19'a bağlı pnömoni nedeniyle yoğun bakım ünitesinde izlendi, hepsi şifa ile taburcu edildi. Gebe hastaların 6'sına klorokin tablet, 4'üne ritonavir (50 mg) ve lopinavir (200 mg) kombinasyonu, birine ise favipiravir başlandı. Gebelerin 9'una sezeryan, 12'sine ise normal doğum uygulandı.

Sonuç: Bu çalışmada izlenen gebelerde COVID-19 infeksiyonunun klinik seyrinin hafif olduğunu, biri dışında tüm bebeklerin sağlıklı olarak doğduğunu gözlemledik. COVID-19 infeksiyonuna bağlı olarak gebelerde ve fetüste gelişebilecek komplikasyonların en aza indirilmesi için hastaların yakın takibinin gerekli olduğu düşüncesindeyiz. Ayrıca, gebelere COVID-19 aşısı uygulanması, hastalıktan korunmada önem taşımaktadır.

Anahtar kelimeler: COVID-19, gebelik, yenidoğan, klinik izlem

Corresponding Author/Sorumlu Yazar: Salih Cesur, Ankara Training and Research Hospital, Clinic of Infectious Diseases and Clinical Microbiology, Ankara, Turkey
E-mail/E-posta: scesur89@yahoo.com
Received/Geliş: 21.11.2022 **Accepted/Kabul:** 07.12.2022

INTRODUCTION

Novel coronavirus disease 2019 (COVID-19) caused by the SARS-Cov-2 virus is a viral infection that was first detected in Wuhan, China in December 2019. It is obvious to affect many organs and systems, such as the lungs, heart, and central nervous system, and its rapid spread has led it to be declared a pandemic in the world. A study involving 215 pregnant women in the United States reported SARS-CoV-2 positivity in 33 (15%) of the cases, the majority of whom were asymptomatic (1). In a further study, it was reported that 71% of the cases that were asymptomatic during pregnancy developed symptoms during labor or in the postpartum period (2). While pregnancy is not reported as a risk factor for COVID-19, the clinical symptoms may be more severe due to the physiological changes in the natural course of pregnancy (2).

There is a paucity of research in our country regarding the clinical course of COVID-19 among the pregnant and fetuses (3,4). Therefore, the present study evaluated the clinical and laboratory findings and treatment outcomes of the pregnant diagnosed with COVID-19 who were admitted different clinics in the Ankara Training and Research Hospital.

MATERIAL AND METHOD

The study included 21 pregnant women diagnosed with COVID-19 by RT-PCR (Bioksen, Turkey) in Ankara Training and Research Hospital between 22. 04. 2020 and 27.09.2021. All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. The clinical symptoms, laboratory findings, and treatment outcomes of the patients, as well as the health status of the pregnant and newborns, were retrospectively examined. Up until the postpartum period, the patients were examined by both obstetricians and infectious disease specialists, who further followed the symptoms and health status of both the patients and their babies.

The Ministry of Health and the Ethics Committee of Ankara Training and Research Hospital granted ethical approval to this study (Date: 09.29.2021 and Decision No: E-21-667), and all patients provided their written informed consent for voluntary participation in the study.

RESULTS

The sample consisted of 10 Turkish 11 foreign national pregnant patients aged 20–41 years with a mean age of 28.76 years. All patients were unvaccinated. Considering underlying diseases, one had hypertension, and one had thyroid disease. Moreover, the clinical course of COVID-19 was severe in one patient, mild in 14 patients, and moderate in six patients.

The symptoms detected at the time of presentation were as follows by frequency: cough (n=10), fatigue (n=8), sore throat (n=6), dyspnea (n=5), fever (n=3), myalgia (n=3), joint pain (n=1), and diarrhea (n=1). None of the patients had complaints of loss of taste and/or inability to smell.

In the physical examination of the patients, a fever of 37.4 °C and above was found in 3 patients, and rales were detected in one patient. In addition, tachycardia was present in eight patients, and one patient had hypotension.

One patient had tachypnea (respiratory rate: 32) with a SpO_2 of 78, while SpO_2 was ranged between 95–98 in the other patients. The patient with the low SpO_2 was followed in the intensive care unit (ICU) with a preliminary diagnosis of COVID-19 pneumonia and was not treated with chloroquine or antiviral treatment for COVID-19. The patient recovered fully following ICU supportive therapies (oxygen and low-molecular-weight heparin). It was also determined that the newborn had a low birth weight (1750 g) in this patient with a cesarean delivery.

Laboratory findings revealed lymphopenia in six patients (normal lymphocyte count: ≥1,000), leukocytosis in four patients (normal leukocyte count: 10,300/mm3), elevated C-reactive protein (CRP) in 13 (61.9%) patients (reference: 0-5 mg/dL), elevated ALT in one patient, and elevated AST in three patients. D-dimer was above the reference value (500 micg/l) in 13 (61.9%) patients.

Although one (4.7%) pregnant patient was followed up in ICU, all patients were eventually discharged upon full recovery.

Six of the patients were initiated on chloroquine tablets, four on a combination of ritonavir (50 mg) and lopinavir (200 mg), and one on favipiravir in the postpartum period. The others were followed up without medication. Neither those receiving medication nor their babies developed complications.

Nine patients (42.8%) had a cesarean section, and 12 (57.1%) had a normal delivery. During follow-ups, one (4.7%) patient developed intrauterine fetal death at the 27th week of gestation, but a definite conclusion could not be ascertained whether it was associated with COVID-19. Besides, two (14.2%) of the 14 newborns had low birthweight (<2500 g). The other fetuses were reported to be healthy during follow-ups, and none developed complications following birth. The mean weight of the 14 newborns was 2,815 g (max=3,460 g and min=2,200 g). The findings of the patients and newborns are presented in **Table 1**.

The symptoms and physical examination findings of the patients are presented in **Table 2**.

Table 1. Findings of the pregnant with COVID-19 and newborns

Patient no.	Age (years)	Gestational week	Length of hospitalization (days)	Treatment	ICU admission	Type of delivery	Birth weight (g)	Newborn status
1	37	28	6	Chloroquine	No	Cesarean section	3070	Healthy
2	24	18	6	None	No	Normal	-*	-
3	26	4	7	Lopinavir/Ritonavir	No	Normal	-	-
4	29	14	9	Lopinavir/Ritonavir/ Chloroquine	No	Cesarean section	3000	Healthy
5	20	29	1	None	No	Normal	-	-
6	21	32	6	Chloroquine	No	Normal	2580	-
7	36	6	2	Lopinavir/Ritonavir	No	Normal	-	-
8	30	38	9	None	Yes	Cesarean section	3020	Healthy
9	30	32	4	Chloroquine	No	Cesarean section	2200	Healthy
10	27	38	1	None	No	Normal	3460	Healthy
11	21	-	6	Chloroquine	No	Normal	2750	-
12	29	39	1	None	No	Normal	3150	-
13	27	32	11	Chloroquine	No	Cesarean section	2900	Healthy
14	25	33	5	Lopinavir/Ritonavir	No	Normal	2940	-
15	28	-	14	Chloroquine	No	Normal	2500	Healthy
16	31	38	2	None	No	Cesarean section	3215	Healthy
17	39	28	2	None	Yes	Cesarean section	1750	Healthy
18	23	-	2	None	No	Normal	2880	Healthy
19	27	27	2	None	No	Cesarean section	-	Intrauterine death
20	41	36	1	None	No	Cesarean section	-	-
21	33	22	3	None	No	Normal	-	-

(*) Patient data not available.

Table 2. Symptoms and physical examination findings of the patients

Symptoms	n	%
Fever	3	14.2
Cough	10	47.6
Dyspnea	5	23.8
Shore throat	6	28.4
Fatigue	8	38.1
Arthralgia	1	4.7
Myalgia	3	14.2
Headache	1	4.7
Diarrhea	1	4.7
Anosmia/Hypogeusia	0	0
Physical examination		
Fever	3	14.2
Tachypnea	0	0
Tachycardia	8	38.1
Hypotension	1	4.7
Low SPO_2 (<93%)	1	4.7
Rales in the lungs	1	4.7

The laboratory findings of the pregnant COVID-19 patients are presented in **Table 3**.

DISCUSSION

COVID-19 is a viral infection that quickly evolved into a pandemic and is associated with fever, cough, shortness of breath, nausea, vomiting, headache, sore throat, fatigue, and loss of smell and tastes. Even though the previous research reported similar COVID-19-related symptoms in both pregnant and non-pregnant adults, primary symptoms reported in pregnant patients are often new-onset fever, cough, shortness of breath, headache, sore throat, and loss of taste and/or smell (2) .

In their prospective study on 533 Turkish pregnant patients with COVID-19, Sahin et al. (3) reported comorbid diseases in 161 (30.2%) of the patients: 44.1% obesity, 17.4% hypothyroidism, 514.3 hypertension, 4.3% Type 2 diabetes mellitus (T2DM), and 4.9% asthma, respectively. Given the underlying diseases among the patients in the present study, one patient (4.7%) had hypertension, and one (4.7%) had thyroid disease. In this study, the pregnant with COVID-19 aged between 20-41 years with a mean age of 28.76 years. Not all patients were vaccinated against COVID-19. In the study by Sahin et al. (3), the mean age of the patients was reported to be 28.04±5.84 years. In the same study, the most common

Table 3. Laboratory findings of the patients

Patient no.	NLO*	White blood cell	Lymphocyte	Thrombocyte	Sedimentation rate	Prothrombin time	Fibrinogen	CRP	ALT	AST	LDH	GFR**	CRE	CK	CK-MB	Troponin	D-Dimer	Ferritin
1	2.76	6,660	1,510	217,000	21	14.7	435	43.17	95	236	242	147	0.3	16	-		650	-
2	2.42	3,750	970	202,000	34	-*	-	9.04	6	16	-	133	0.53	55	-		1,180	-
3	3.31	4,470	910	181,000	15	14.8	325	1.17	12	16	-	114	0.73	46	-	12.87	370	23.9
4	10.73	7,300	560	186,000	25	14.9	403	15.2	13	16	140	131	0.5	-	0.85	7.56	430	-
5	3.83	6,960	1,250	353,000	62	-	494	21.68	12	14	210	146	0.45	65	-	3.45	3,310	-
6	3.81	6,390	1,240	54,000	51	15.3	-	8.21	9	18	273.08		0.53	53.85	-	3	490	10.7
7	3.19	5,260	1,140	239,000	42	14.1	487	43.99	18	20	238	122	0.54	47	<0.3	6.93	400	81.3
8	4.8	8,350	1,340	119,000	11	12.4	503	2.39	20	40	364	119	0.66	212	18.06	316.8	1,040	18.2
9	6.42	10,900	1,360	202,000	36	10.9	147	4.23	9	15	172	136	0.44	85	3.68	9.45	460	22.7
10	4.74	7,830	1,290	153,000	53	-	508	53.84	14	24	284	122	0.67	312		<0.3	790	-
11	3.82	6,790	1,360	144,000	19	13.1	393	24.99	11	17	207.44	142	0.47	69.12	1.98	3.86	750	-
12	6.38	11,760	1,510	208,000	22	14.6	-	0.55	6	17	-	126	0.58	-	-	-	520	-
13	3.29	6,270	1,290	123,000	15	-		3.64	9	17	-	136	0.47	-	-	-	210	67.1
14	5.98	6,010	830	316,000	80	19.8	711	58.2	11	20	311	124	0.64	72	1.94	3.09	550	26.9
15	1.49	4,060	1,400	187,000	11	13.6	306	0.58	22	21	175.64	127	0.57	73.95	1.19	<0.3	440	-
16	3.8	8,000	1,550	285,000	16	13.2	-	1.02	11	25		134		-	-	2.08	1,610	-
17	5.5	7,610	1,090	216,000	6	-	-	57.2	24	6	427	130	0.42	69	-	-	1,690	-
18	8.6	9,770	920	168,000	63	12.1	-	15.1	22	12	-	141		-	-	-	1,630	-
19	8.3	13,470	1,350	111,000	2	16.7	105	4.5	11	27	365	130	0.54	246	-	-	8,580	-
20	3	12,360	2,820	236,000	31	13.3	-	6.5	8	13		127	0.43	-	-	-	410	-
21	5.7	5,880	830	122,000	33	11.9	-	59.4	32	57	283	128	0.5	-	1.48	<0.3	810	-

(-)*: Patient data not available, NLO*: Neutrophil lymphocyte ratio; GFR**: Glomerular filtration rate

symptoms in patients were reported to be cough (33.4%) and myalgia (31.5%), followed by dyspnea (18.8%), dry throat (15.6%), fever (13.3%), headache (12.2%), anosmia (12%), dysgeusia (8.6%), diarrhea (3.9%), and chest pain (2.2%).

Shmakov et al. (5) prospectively evaluated 66 pregnant patients and 46 newborns with PCR-confirmed COVID-19. In the study, the major clinical symptoms in the patients were detected to be cough (51.5%), anosmia (34.9%), and hyperthermia (33.3%).

In this study, the most common symptoms in the patients were found to be cough (47.6%), fatigue (38.1%), sore throat (28.4%), and dyspnea (23.8%), followed by headache, joint pain, and diarrhea (4.7%). Yet, there was no loss of taste and/or the inability to smell in any of the patients.

The physical examinations of the participants yielded a fever of 37.4 °C and above in 14.2% and rales in 4.76%. Moreover, tachycardia and hypotension were present in 38% and 4.76% of the patients, respectively. On the other hand, Sahin et al. (3) reported tachycardia (28.1%), fever (13.3%), tachypnea (3.4%), and low oxygen saturation (2.8%; ≤ 93%) in the physical examinations of their patients.

In this study, the laboratory findings yielded lymphopenia in 6 patients, higher CRP values in 13 patients, and excessive D-dimer values (above 1000) in 6 patients. Moreover, AST in one patient and ALT in three patients were above reference values. Shmakov et al. (5) reported the laboratory findings of their patients as increased lactate dehydrogenase (LDH), creatinine, D-dimer, and C-reactive protein (CRP) values, anemia, and leukopenia. In the same study, spontaneous abortion was reported in 6.1% of the patients. The mean weight of newborns was found to be 3283±477 g., and no COVID-19 infection was diagnosed in any of the newborns. In another study, nine pregnant women with PCR-confirmed COVID-19 pneumonia were retrospectively evaluated at Wuhan University in China. Accordingly, five patients had lymphopenia, and three had elevated aminotransferase enzyme levels. None of the patients developed severe pneumonia or death, and the newborns were all alive. Amniotic fluid, cord blood, newborn throat swab, and breast milk samples from six patients were tested for COVID-19, and no infection was detected in any of the samples. The study also reported that the clinical features of COVID-19 pneumonia in the pregnant were similar to non-pregnant adult patients with COVID-19 pneumonia (11).

In this study, all patients were followed up in the wards, and none of the patients required imaging tests (PA chest X-ray, computed tomography) due to

pregnancy. In their study, Sahin et al. (3) hospitalized 297 (55.7%) of 533 pregnant patients with COVID-19 and detected suspicious lesions in the radiological imaging of 39 (7.3%) patients. While 261 (49%) of the patients received treatment for COVID-19, 509 (95.5%) had a mild course, 7 (1.3%) were followed up in the intensive care unit, and two patients required mechanical ventilation. Maternal mortality developed in 2 (0.4%) cases, and 66 patients developed the following complications: preterm delivery (4.1%) and miscarriage (2.2%). In the same study, the rate of cesarean section was determined to be 66.4%, while the PCR test for COVID-19 was found to be negative in all newborns, and COVID-19 was reported in only one mother's breast milk sample. The authors recruited 261 (48.9%) patients for treatment for COVID-19 and 33 (6.2%) for pregnancy-specific treatment (tocolytic agents, antenatal corticosteroids, etc.). In this study, low molecular weight heparin was administered to 220 (41.3%) patients; 55% (10.3%) of the patients were treated with chloroquine, 33 (6.2%) received lopinavir-ritonavir, and 17 (3.2%) received azithromycin, and 6 (1.1%) had favipiravir.

In the present study, the clinical course was determined to be severe in one patient, moderate in 6 patients, and mild in 14 patients. The diagnosis was decided upon RT-PCR test positivity, and no mortality occurred in any of the patients.

Only one patient was followed up in the intensive care unit because of her tachypnea and SpO_2 value of 78. After supplement therapy (oxygen and low-molecular-weight heparin), the patient completely recovered. Intrauterine death occurred in the infant of a 27-year-old pregnant woman in her 27th week of pregnancy, and the pregnancy was terminated by cesarean section. Yet, a definitive conclusion could not be reached as to whether the infant loss was associated with COVID-19. No health-related problems were detected in other patients and newborns. In this study, we started chloroquine in six patients, ritonavir (50 mg) and lopinavir (200 mg) combination in four, and favipiravir in one patient in the postpartum period.

The previous findings of screening for pregnant patients yielded about 15% SARS-CoV-2 positivity (1,2). Although the pregnancy was not reported as a risk factor for COVID-19, it should be noted that symptoms and clinical findings may be severe due to physiological and immunological changes during pregnancy. In a study in which more than 90,000 patients with COVID-19 were screened in the United States, it was reported that the rates of hospitalization in the intensive care unit and intubation in pregnant patients were significantly higher than those in non-pregnant patients (2, 6).

In the COVID-19 treatment of the pregnant, the adult treatment guideline of the Ministry of Health released in July 2020 recommended that chloroquine and lopinavir/ritonavir combination and favipiravir could be used in severe cases (7). In this study, drug-related side effects did not develop in any of the patients and newborns who were started on drug therapy for COVID-19, according to the treatment guideline above. Recent randomized controlled studies have shown that chloroquine has no help in COVID-19 treatment (2, 8). Although the lopinavir/ritonavir combination used in the treatment of HIV in pregnant COVID-19 patients was reported to be safe, subsequent studies documented that it was ineffective in the treatment. In contrast, it might cross the placenta and, thus, increase the risk of premature birth. In addition, insufficient evidence was reported regarding the efficacy and safety of remdesivir, one of the antiviral drugs recommended for the treatment of the pregnant with COVID-19 (9). The literature also hosts studies indicating an increased risk of thromboembolism in pregnant COVID-19 patients. Therefore, routine thromboprophylaxis is often recommended for hospitalized pregnant patients with no contraindications (severe thrombocytopenia or bleeding) (1,2,5,10). In this study, low-molecular-weight heparin therapy was administered to all patients for thromboembolism prophylaxis according to findings of D-dimer values and glomerular filtration rates.

In the study, nine patients had a cesarean section, and 12 had a normal delivery. During the follow-ups, intrauterine death developed in one of the patients at the 27th week of pregnancy. Since any microbiological tests or autopsy could not be performed for the diagnosis of the dead newborn, it could not be concluded whether intrauterine death was associated with COVID-19. The mean birth weight of 14 newborns followed up after birth was 2,815 g (max=3,460 g and min=2,200 g), but two of them (14.2%) had low birth weight (< 2,500 g). No postnatal pathological findings and no complications were detected in the newborns. In a study with 125 pregnant women from Turkey, the rates of cesarean delivery, prematurity, and low birth weight were reported as 71.2%, 26.4%, and 12.8%, respectively. In this study, 8 (6.4%) of the COVID-19-positive patients were treated with mechanical ventilation, but six patients (4.8%) died. Most of the newborns were followed up in the neonatal intensive care unit, and RT-PCR positivity was detected in 4 (3.3%) of 120 newborns (4).

The previous research reported pregnancy-related adverse events such as pneumonia and preterm delivery among the pregnant with coronavirus, including COVID-19. Moreover, it was discovered that COVID-19 infection is associated with higher rates of preterm birth, fetal distress, preeclampsia, cesarean section, and perinatal death

among the pregnant (3, 10). However, there is no evidence of vertical transmission from the mother with COVID-19 to the infant (11, 12). In this study, only one patient was followed up in the ICU without being connected to a mechanical ventilator, and this patient recovered following oxygen and low-molecular-weight heparin treatment. Besides, the newborn had a low birth weight (1,750 g) in this patient undergoing cesarean delivery.

A meta-analysis study reported that COVID-19 infection in the pregnant to be often asymptomatic. Severe and critical illness rates were found to be similar to those in the general population (13).

Another meta-analysis reported that the incidence of symptoms (e.g., fever, shortness of breath, and muscle pain) becomes lower in the pregnant with COVID-19 applying to a healthcare institution for any reason. In contrast, the same study revealed that the pregnant might have higher rates of ICU admission or the need for invasive ventilation. Moreover, pre-existing comorbidities, non-Caucasian ethnicity, chronic hypertension, older maternal age, and increased body mass index were determined to be the risk factors for severe COVID-19 in pregnancy. In addition, pregnant women with COVID-19 infection are more likely to give birth prematurely than those without COVID-19. In turn, the newborns of pregnant COVID-19 patients are more likely to be admitted to the neonatal unit than those without COVID-19 (14).

The American Society of Obstetrics and Gynecology has published guidelines recommending that the pregnant be vaccinated against COVID-19 since the relevant research reported COVID-19 vaccines to be highly safe during pregnancy (15).

mRNA or inactivated vaccines administered during pregnancy are relatively safe. In addition, initial teratogenicity research on COVID-19 vaccines in animal models showed no adverse effects on embryonic and fetal development or reproduction (16).

In Turkey, the Ministry of Health recommends inactivated or mRNA vaccines against COVID-19 to the pregnant. Yet, none of the pregnant in this study were vaccinated at the time of the study.

The present study is not free of a few limitations. Since it employed a retrospective design, some data of the patients could not be reached. Moreover, sampling was not performed for RT-PCR tests for COVID-19 in newborns. Finally, long-term follow-up data on the patients were lacking.

Overall, it is thought that close follow-ups for the pregnant are needed to minimize complications that may develop in them and their fetuses due to COVID-19 infection.

CONCLUSION

The COVID-19 vaccine seems to be a must for the pregnant to prevent all possible COVID-related complications.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of The Ministry of Health and the Ethics Committee of Ankara Training and Research Hospital granted ethical approval to this study (Date: 09.29.2021, Decision No: E-21-667).

Informed Consent: All patients signed the free and informed consent form.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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