



DOI: 10.5505/anatoljfm.2023.39206

Anatol J Family Med 2023;6(1):2-6

## Laboratory Measurements and Thorax Computed Tomography Findings for Inpatient Pregnant with COVID-19

Merve Aldıkaçtıođlu Talmaç,<sup>1</sup> Pınar Yalçın Bahat,<sup>1</sup> Ali Kocataş,<sup>2</sup>  
Ayşegül Bestel,<sup>1</sup> Ozan Karadeniz,<sup>1</sup> İbrahim Polat<sup>1</sup>

<sup>1</sup>Department of Obstetrics and Gynecology, Kanuni Sultan Süleyman Training and Research Hospital, University of Health Sciences, Istanbul, Türkiye

<sup>2</sup>Department of General Surgery, Kanuni Sultan Süleyman Training and Research Hospital, University of Health Sciences, Istanbul, Türkiye



Please cite this article as:  
Aldıkaçtıođlu Talmaç M, Yalçın Bahat P, Kocataş A, Bestel A, Karadeniz O, Polat İ. Laboratory Measurements and Thorax Computed Tomography Findings for Inpatient Pregnant with COVID-19. Anatol J Family Med 2023;6(1):2-6.

Address for correspondence:  
Dr. Merve Aldıkaçtıođlu Talmaç,  
Department of Obstetrics  
and Gynecology, Kanuni  
Sultan Süleyman Training and  
Research Hospital, University  
of Health Sciences, Istanbul,  
Türkiye

Phone: +90 532 560 23 66

E-mail: drmrve@hotmail.com

Received Date: 12.04.2021

Revision Date: 13.05.2022

Accepted Date: 18.04.2023

Published online: 28.04.2023

©Copyright 2023 by Anatolian  
Journal of Family Medicine -  
Available online at  
www.anatoljfm.org

OPEN ACCESS



This work is licensed under a Creative  
Commons Attribution-NonCommer-  
cial 4.0 International License.

### ABSTRACT

**Objectives:** The purpose of this study was to evaluate the laboratory measurements and thorax computed tomography (CT) findings of pregnant women with COVID-19.

**Methods:** This was a single-center, observational study performed in a Training and Research Hospital from March 1 to May 31, 2020. Laboratory data, clinical conditions, and thorax CT images of pregnant women with COVID-19 were analyzed retrospectively. The patients who agreed to the image and were not suspected of pneumonia were classified according to their degree of lung involvement.

**Results:** A total of 155 pregnant women have included in the study, and the thorax CT of 86 (55.5%) pregnant women who participated in the study was evaluated. While no symptoms were observed in 44 (28.4%) of the pregnant women, the most common symptoms were dyspnea and cough in 27 (17.4%). Of the pregnant women evaluated for thorax CT, 24 (27.9%) had negative, 19 (21.1%) had mild involvement, 30 (34.9%) had moderate involvement, and 13 (15.1%) had heavy involvement. C-reactive protein (CRP) levels of pregnant women with negative tomography were 4.5 (0.7-83.4) mg/L, 13.4 (0.7-107.3) mg/L with mild involvement, 37.7 (3.8-292.6) mg/L with moderate involvement and, 48.6 (5.7-234.1) mg/L with heavy involvement ( $p<0.001$ ).

**Conclusion:** All factors affecting the prognosis for pregnant women with COVID-19 have not been fully elucidated. It was determined that a significant frequency of pregnant women was asymptomatic. In addition, an increase was observed in the CRP level according to the severity of pneumonia, while no similar difference was found in the D-dimer level.

**Keywords:** COVID-19, pneumonia, pregnancy, tomography

### INTRODUCTION

The disease due to coronavirus infection appeared in Wuhan, China, in December 2019, spread rapidly worldwide and created a major public health problem.<sup>(1)</sup> In February 2020, the World Health Organization defined the virus, which is the causative agent of the disease as "severe acute respiratory syndrome coronavirus 2" and the disease as COVID-19. By February 8, 2021, worldwide, a total of 106,056,229 patients were diagnosed with COVID-19 infection, and 2,315,156 of them lost their lives. In Turkey, at the same time, in comparison to the worldwide numbers, 2,531,456 patients were diagnosed, while a total of 26,797 deaths occurred.

Pregnant women are more susceptible to respiratory infections, but when the current data were evaluated, no increased sensitivity of COVID-19 infection and no significant difference was found in terms of clinical course in pregnant women compared to the normal population.<sup>[2]</sup> No evidence of intrauterine infection and congenital infection has been found, but it is difficult to make a firm decision on this issue as the number of cases is low.<sup>[3]</sup>

Pregnant women who suffer complaints such as cough, shortness of breath, fever, or have a contact history are given diagnostic tests with suspicion of COVID-19.<sup>[4]</sup> The diagnosis can be made by detecting reverse transcriptase polymerase chain reaction (RT-PCR) in the swab from the nasal or oropharyngeal regions, by conducting serological tests such as rapid antibody tests that detect ELISA or IgM/IgG, or by antigen tests of the virus with suboptimal sensitivity.<sup>[5,6]</sup> Methods such as lung ultrasound and thorax computed tomography (CT) can be used to evaluate lung findings in pregnant women.<sup>[7,8]</sup>

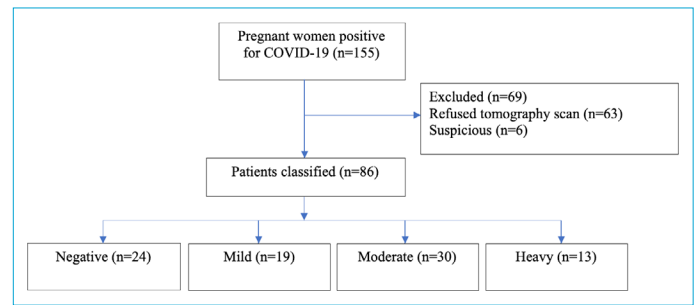
Although being asymptomatic or mildly symptomatic is a good prognosis for patients, COVID-19 disease can cause many symptoms, from pneumonia to acute respiratory distress syndrome and even death.<sup>[9,10]</sup> To date, there are few reports in the literature focusing on clinical, laboratory, and thorax CT results of pregnant women with COVID-19. Within this study, patients are classified according to thorax CT findings as mild, moderate, and severe; and these groups are compared for their clinical behavior and laboratory test results.

This study aimed to investigate the relationship between laboratory measurements and thorax CT findings in pregnant women with COVID-19.

## METHOD

This retrospective, single-center observational study was conducted on all pregnant women over 18 years of age with COVID-19 and who applied to Training and Research Hospital between March 1 and May 31, 2020. A total of 155 pregnant women with positive RT-PCR with thorax CT or diagnosed with COVID-19 were included in the study. Pregnant women who refused to participate in the study, those with suspicious thorax CT findings, and patients with chronic lung disease and a history of pulmonary tuberculosis were excluded from the study. The flow diagram of the study is shown in Figure 1.

Demographic features of patients, age, gestational age, obstetric history, chronic diseases, symptoms, thorax CT findings, vital signs (fever and peripheral blood oxygen satu-



**Figure 1.** The flow diagram of the study.

ration values), COVID-19 contact history, and treatments were examined. In accordance with the guidelines of the Ministry of Health at that time, a nasal swab was taken from every pregnant woman who applied to our clinic with the suspicion of COVID-19, a thorax CT was requested, and a blood test was performed. A radiation protective barrier was placed around the umbilicus during the thorax CT scan. The following parameters were evaluated in the blood tests taken before the patients were given any treatment; lymphocyte, D-Dimer, ferritin, and C-reactive protein (CRP). All measurements were taken from the test results, which were initially applied to patients with COVID-19. After all evaluations, patients with indications for hospitalization were hospitalized. Those with indications for hospitalization; it was as follows; those with moderate or severe involvement in thorax CT, those who have complaints, especially dyspnea, the peripheral blood oxygen saturation value below 93% in the room air, and those with 4 blood parameters which were associated with poor prognosis based on the guidelines published by the Turkey Health Ministry.<sup>[11]</sup>

Patients undergoing thorax CT imaging were classified by radiologists as negative, mild, moderate, and severe. The groups were classified as follows: negative if there are no lung findings supporting pneumonia; severe if there are bilateral, diffuse, multifocal, with consolidating ground-glass opacities; and mild if there are unilateral, non-consolidating, ground-glass opacities with no specific distribution. Those between severe and mild were classified as moderate. The risk classification of patients with involvement in thorax CT was determined subjectively by the radiologist.

Statistical analyses were performed using IBM SPSS v.22 for Windows software. The distribution normality of the continuous variables was calculated with the Kolmogorov-Smirnov test. Descriptive statistics were expressed as mean, standard deviation, median, minimum, and maximum for continuous data and frequency and percentage for categorical data. The groups were compared with the Kruskal-Wallis test for the non-normally distributed variables. Post-hoc multiple comparison analysis was performed with

significant values that have been adjusted with Bonferroni correction. Yates' Chi-square test was used for categorical variables in sparse contingency tables. Analyses of  $p < 0.05$  were considered statistically significant.

## RESULTS

A total of 155 COVID-19 pregnant patients were included in the study. Obstetric characteristics, symptoms, and treatments of pregnant with COVID-19 are summarized in Table 1.

<b>Table 1.</b> Obstetric features, symptoms and treatments of pregnant with COVID-19	
	<b>Mean±SD</b>
Maternal age (years)	27.9±6.4
Gestational age (weeks)	27.4±9.7
	<b>Median (min-max)</b>
Gravida	2.0 (1.0-8.0)
Parity	1.0 (0.0-6.0)
	<b>n (%)</b>
Contact history	
No	77 (49.7)
Yes	78 (50.3)
Chronic disease	
None	149 (96.1)
Type 2 diabetes mellitus	4 (2.6)
Hypothyroid	2 (1.3)
Treatments	
None	74 (47.7)
Hydroxychloroquine	45 (29.0)
Hydroxychloroquine+azithromycin	8 (5.2)
Hydroxychloroquine+azithromycin+oseltamivir	11 (7.1)
Hydroxychloroquine+lopinavir/ritonavir	12 (7.8)
Hydroxychloroquine+lopinavir/ritonavir+azithromycin	5 (3.2)
Symptoms	
None	44 (28.4)
Cough	24 (15.5)
Dyspnea	9 (5.8)
Anosmia	2 (1.3)
Tiredness	19 (12.2)
Fever+cough	8 (5.2)
Dyspnea+cough	27 (17.4)
Fever+dyspnea+cough	15 (9.7)
Cough+fever+anosmia	5 (3.2)
Diarrhea	2 (1.3)

SD: Standard deviation.

Thorax CT of 86 (55.5%) pregnant women who participated in the study was evaluated. Of the pregnant women evaluated for thorax CT, 24 (27.9%) had negative, 19 (21.1%) had mild involvement, 30 (34.9%) had moderate involvement, and 13 (15.1%) had heavy involvement.

When fever measurements of pregnant women were evaluated according to thorax CT findings, fever was found to be 36.5 (36.0–37.0) C° in those with CT negative, 36.5 (35.6–38.0) C° in those with mild involvement, and 36.5 (35.5–37.7) C° in those with moderate involvement, and 36.7 (35.6–39.0) C° in those with heavy involvement ( $p=0.491$ ). Laboratory measurements according to thorax CT findings are summarized in Table 2.

When symptoms of pregnant were evaluated according to thorax CT findings, CT findings negative was 14 (53.8%), mild involvement was 6 (23.1%), moderate involvement was 6 (23.1%), and heavy involvement was 0 (0.0%) of asymptomatic pregnant women. Symptoms of pregnant women with COVID-19 according to thorax CT findings are summarized in Table 3.

## DISCUSSION

This study was the single-center study performed, which involved COVID-19 pregnant patients. The patients were divided into groups according to their thorax CT findings and were analyzed for their relationship with respect to symptoms and clinical and laboratory values for each group.

Lippi and Favalaro scanned about 80 documents in a letter to the editor and showed that patients with severe COVID-19 had higher D-dimer values than lighter forms of COVID-19, according to recent literature data.<sup>[12]</sup> However, the documents examined did not include the pregnant patient group whose D-dimer levels rise up physiologically as a natural result of the pregnancy; however, this study represents a large series of that specific group. This study has shown that as the thorax CT findings got severe, there was an increase in D-dimer levels; nevertheless, it was not statistically significant. Therefore, in our opinion, D-dimer is not a prognostic factor in pregnant patients. In the study of Zhang et al., which included 343 patients, which also does not concern the pregnant patient group, the optimum cut-off value of D-dimer was taken as 2.0 µg/mL, and patients with D-dimer  $\geq 2.0$  µg/mL were compared with  $< 2.0$  µg/mL. A higher incidence of mortality was detected in patients with  $\geq 2.0$  µg/mL.<sup>[13]</sup> In a study conducted by Wang et al. retrospectively to evaluate the clinical features and laboratory test results of the disease in pregnant women, they found that CRP and D-dimer levels were significantly

**Table 2.** Laboratory measurements according to thorax CT findings

	Negative (n=24)	Mild (n=19)	Moderate (n=30)	Heavy (n=13)	p
CRP (mg/L)	4.5 (0.7-83.4)	13.4 (0.7-107.3)	37.7 (3.8-292.6)	48.6 (5.7-234.1)	<0.001
D-dimer (mg/L)	1.7 (0.3-7.2)	1.6 (0.6-6.7)	1.8 (0.8-7.1)	2.1 (0.2-10.5)	0.466
Lymphocyte (10 <sup>3</sup> /μL)	1.6 (0.8-3.8)	1.1 (0.5-1.9)	1.3 (0.6-6.3)	1.2 (0.5-8.5)	0.008
Ferritin (ng/mL)	25.7 (5.8-118.0)	20.1 (9.4-137.6)	32.2 (14.8-355.4)	49.5 (10.6-227.1)	0.002
Blood oxygen saturation (%)	98.0 (96.0-100.0)	98.0 (96.0-100.0)	97.0 (88.0-100.0)	96.0 (88.0-98.0)	0.002

CRP: C reactive protein; CT: Computed tomography.  
Data are presented as median (minimum-maximum).  
Kruskal-Wallis test.

**Table 3.** Symptoms of pregnant women with COVID-19 according to thorax CT findings

	Negative (n=24)	Mild (n=19)	Moderate (n=30)	Heavy (n=13)	p
None	14 (53.8)	6 (23.1)	6 (23.1)	0 (0.0)	0.009
Cough	4 (33.3)	3 (25.0)	5 (41.7)	0 (0.0)	
Dyspnea+cough	2 (13.3)	2 (13.3)	6 (40.0)	5 (33.4)	
Fever+dyspnea+cough	0 (0.0)	2 (20.0)	2 (20.0)	6 (60.0)	

CT: Computed tomography.  
Data are presented as n (%).  
Yates' Chi-Square test.

higher than those who were not pregnant.<sup>[14]</sup> In this study, 30 pregnant and 42 non-pregnant were conducted.

In a study of 158 pregnant women with COVID-19 by Andrikopoulou et al., they found the symptoms of fever, myalgia, cough, sore throat, dyspnea, congestion, chest pain or pressure, diarrhea, headache, loss of taste or smell, and nausea.<sup>[15]</sup> They classified the disease according to symptoms as either "mild or asymptomatic" or "moderate or severe." They found a significantly higher risk of chest pain, pressure, and cough in the moderate or severe disease group. In this study, symptoms such as anosmia, cough, fever, weakness, shortness of breath, diarrhea, or a combination of these were observed, as well as pregnant women without symptoms. In this study, the patients were classified objectively as negative, mild, moderate, and heavy according to their thorax CT findings rather than their symptoms. Accordingly, when the CT findings were compared with symptoms, it was found that as the number of symptoms increased, thorax CT findings got worse. In addition, no severe thorax CT findings were found in the asymptomatic group.

In a study conducted by Wang et al. in China, the data of 114 COVID-19 patients were retrospectively analyzed and found a negative correlation between thorax CT findings

and peripheral blood oxygen saturation.<sup>[16]</sup> In other words, the heavier the CT findings get, the more peripheral blood oxygen saturation values decrease. Similar to the study of Wang et al., when peripheral blood oxygen saturation values were compared with thorax CT groups, the similarity was observed in this study.

In the study of Wang et al., a negative correlation was also found between lymphocyte counts and CT findings.<sup>[16]</sup> In a letter to the editor published by Lin et al., they retrospectively looked at the data of 147 patients and found that ferritin values were significantly higher for severe patients.<sup>[17]</sup> In a study conducted by Terpos et al., they found that CRP values correlated with the severity of the disease. The same study says that lymphopenia has a very important role in prognosis.<sup>[18]</sup> When the lymphocyte count, ferritin, D-dimer, and CRP levels, which were determined by the Turkey Ministry of Health as poor prognostic factors, were compared with thorax CT findings, it was found that with the exception of D-dimer, all other factors differed significantly between thorax CT groups.

## CONCLUSION

In this study, it was determined that a significant frequency of pregnant women with COVID-19 was asymptomatic. In addition, an increase was observed in the CRP level accord-

ing to the severity of pneumonia, while no similar difference was found in the D-dimer level. However, more studies need involving pregnant patient series are needed.

#### Disclosures

**Peer-review:** Externally peer-reviewed.

**Conflict of Interest:** The authors have no conflicts of interest.

**Funding:** None.

**Ethics Committee Approval:** The research was approved by the Kanuni Sultan Suleyman Training and Research Hospital Ethics Committee (Approval date: June 03, 2020, and Approval number: 2020.05.39). Verbal consent was obtained from all participants.

**Authorship Contributions:** Concept - M.A.T.; Design - A.K.; Supervision - P.Y.B.; Materials - O.K.; Data collection and/or processing - O.K.; Analysis and/or interpretation - M.A.T.; Literature search - A.B.; Writing - M.A.T.; Critical review - I.P.

**Acknowledgements:** The authors would like to thank the information processing unit that enables us to access the data in the hospital easily and our valuable patients who allow the use of their data.

#### REFERENCES

- Spiteri G, Fielding J, Diercke M, Campese C, Enouf V, Gaynard A, et al. First cases of coronavirus disease 2019 (COVID-19) in the WHO European Region, 24 January to 21 February 2020. *Euro Surveill* 2020;25(9):2000178. [\[CrossRef\]](#)
- Goyal M, Singh P, Melana N. Review of care and management of pregnant women during COVID-19 pandemic. *Taiwan J Obstet Gynecol* 2020;59(6):791–4. [\[CrossRef\]](#)
- Diriba K, Awulachew E, Getu E. The effect of coronavirus infection (SARS-CoV-2, MERS-CoV, and SARS-CoV) during pregnancy and the possibility of vertical maternal-fetal transmission: a systematic review and meta-analysis. *Eur J Med Res* 2020;25(1):39. [\[CrossRef\]](#)
- Dashraath P, Wong JLJ, Lim MXK, Lim LM, Li S, Biswas A, et al. Coronavirus disease 2019 (COVID-19) pandemic and pregnancy. *Am J Obstet Gynecol* 2020;222(6):521–31.
- Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet* 2020;395(10223):497–506. [\[CrossRef\]](#)
- Herbert E, Fournier D. Viewpoint on COVID-19 pandemic. *Anatol J FM* 2020;3(3):200–4.
- Li M, Lei P, Zeng B, Li Z, Yu P, Fan B, et al. Coronavirus disease (COVID-19): Spectrum of CT findings and temporal progression of the disease. *Acad Radiol* 2020;27(5):603–8. [\[CrossRef\]](#)
- Moro F, Buonsenso D, Moruzzi MC, Inchingolo R, Smargiassi A, Demi L, et al. How to perform lung ultrasound in pregnant women with suspected COVID-19. *Ultrasound Obstet Gynecol* 2020;55(5):593–8. [\[CrossRef\]](#)
- Guan W, Ni Z, Hu Y, Liang W, Ou C, He J, et al. Clinical characteristics of coronavirus disease 2019 in China. *N Engl J Med* 2020;382:1708–20. [\[CrossRef\]](#)
- Chen H, Guo J, Wang C, Luo F, Yu X, Zhang W, et al. Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records. *Lancet* 2020;395(10226):809–15.
- Tanacan A, Erol SA, Yücel A. COVID-19 pandemisi Döneminde riskli gebe İzlemi ve Yönetimi. *Jinekoloji-Obstetrik ve Neonatoloji Tıp Dergisi* 2020;17(2):378–87. [\[CrossRef\]](#)
- Lippi G, Favaloro EJ. D-dimer is associated with severity of coronavirus disease 2019: a pooled analysis. *Thromb Haemost* 2020;120(5):876–8. [\[CrossRef\]](#)
- Zhang L, Yan X, Fan Q, Liu H, Liu X, Liuet Z, et al. D-dimer levels on admission to predict in-hospital mortality in patients with Covid-19. *J Thromb Haemost* 2020;18(6):1324–9. [\[CrossRef\]](#)
- Wang Z, Wang Z, Xiong G. Clinical characteristics and laboratory results of pregnant women with COVID-19 in Wuhan, China. *Int J Gynaecol Obstet* 2020;150(3):312–7. [\[CrossRef\]](#)
- Andrikopoulou M, Madden N, Wen T, Aubey JJ, Aziz A, Baptiste CD, et al. Symptoms and critical illness among obstetric patients with coronavirus disease 2019 (COVID-19) infection. *Obstet Gynecol* 2020;136(2):291–9. [\[CrossRef\]](#)
- Wang K, Kang S, Tian R, Zhang X, Zhang X, Wang Y. Imaging manifestations and diagnostic value of chest CT of coronavirus disease 2019 (COVID-19) in the Xiaogan area. *Clin Radiol* 2020;75(5):341–7. [\[CrossRef\]](#)
- Lin Z, Long F, Yang Y, Chen X, Xu L, Yang M. Serum ferritin as an independent risk factor for severity in COVID-19 patients. *J Infect* 2020;81(4):647–79. [\[CrossRef\]](#)
- Terpos E, Ntanasis-Stathopoulos I, Elalamy I, Kastritis E, Sergentanis TN, Politou M, et al. Hematological findings and complications of COVID-19. *Am J Hematol* 2020;95(7):834–47.