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Respiratory Rate at Admission as an Independent Predictor of Intensive Care Requirement in Pregnant Women with COVID-19: A Retrospective Cohort Study

Başvuru Sırasındaki Solunum Sayısının COVID-19'lu Gebe Kadınlarda Yoğun Bakım Gereksiniminin Bağımsız Bir Prediktörü Olarak Değerlendirilmesi: Retrospektif Kohort Çalışma

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Abstract

Objective: To compare demographic, clinical, laboratory, and obstetric characteristics of pregnant women hospitalized with coronavirus disease-2019 (COVID-19) according to intensive care unit (ICU) requirement and to identify independent predictors of ICU admission.

Method: This retrospective cohort study included pregnant women hospitalized with real time-polymerase chain reaction confirmed COVID-19 at a tertiary referral center between September 2020 and December 2021. Patients were categorized into ICU and non-ICU groups based on clinical course. Demographic, clinical, laboratory, and obstetric parameters recorded at hospital admission were compared between groups. Multivariable logistic regression analysis was performed to determine independent predictors of ICU admission.

Results: A total of 402 pregnant women were included, of whom 49 (12.2%) required ICU admission. Women admitted to the ICU were older and presented at an earlier gestational age than non-ICU patients. At admission, ICU patients had significantly higher respiratory rates and lower oxygen saturation levels. Laboratory evaluation revealed significantly lower lymphocyte counts and

Öz

Amaç: Koronavirüs hastalığı-2019 (COVID-19) nedeniyle hastaneye yatırılan gebelerin yoğun bakım ünitesi (YBÜ) gereksinimine göre demografik, klinik, laboratuvar ve obstetrik özelliklerini karşılaştırmak ve YBÜ yatışının bağımsız belirleyicilerini saptamaktır.

Yöntem: Bu retrospektif kohort çalışmaya, Eylül 2020-Aralık 2021 tarihleri arasında üçüncü basamak bir referans merkezinde gerçek zamanlı-polimeraz zincir reaksiyon ile doğrulanmış COVID-19 tanısı ile hastaneye yatırılan gebeler dahil edildi. Hastalar klinik seyirlerine göre YBÜ ve YBÜ dışı gruplar olarak sınıflandırıldı. Başvuru anındaki demografik, klinik, laboratuvar ve obstetrik veriler gruplar arasında karşılaştırıldı. YBÜ yatışının bağımsız belirleyicilerini tanımlamak amacıyla çok değişkenli lojistik regresyon analizi yapıldı.

Bulgular: Toplam 402 gebe çalışmaya dahil edildi ve bunların 49'u (%12,2) YBÜ'ye yatırıldı. YBÜ'ye kabul edilen gebeler, YBÜ dışı hastalara kıyasla daha ileri yaşta olup daha erken gebelik haftasında başvurmuşlardı. Başvuru anında YBÜ hastalarında solunum sayısı anlamlı derecede daha yüksek, oksijen satürasyonu ise daha düşüktü. Laboratuvar analizlerinde, YBÜ hastalarında lenfosit sayıları anlamlı olarak daha düşük; C-reaktif protein ve prokalsitonin düzeyleri ise belirgin şekilde daha yüksekti. Hemoglobin, hematokrit, toplam

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Abstract

markedly higher C-reactive protein and procalcitonin levels in the ICU group, whereas hemoglobin, hematocrit, total leukocyte count, neutrophil count, platelet count, D-dimer, and fibrinogen levels did not differ significantly between groups. Adverse obstetric outcomes were more frequent among ICU patients, including higher rates of cesarean delivery, preterm birth, and maternal mortality. Median hospital stay was significantly longer in ICU patients compared with non-ICU patients [18 (interquartile range, 13.5-23) vs. 5 (interquartile range, 3-8) days; p<0.001]. In multivariable analysis, respiratory rate at admission remained an independent predictor of ICU admission (adjusted odds ratio: 1.30 per 1 breath/min increase; 95% confidence interval: 1.20-1.41; p<0.001).

Conclusion: In pregnant women hospitalized with COVID-19, ICU admission was primarily associated with acute respiratory compromise rather than baseline obstetric characteristics or routine laboratory parameters. Respiratory rate at admission is a simple, readily available, and clinically meaningful marker that may facilitate early risk stratification and timely management in this population.

Keywords: COVID-19, hypoxemia, intensive care unit, pregnancy, respiratory failure

Öz

lökosit sayısı, nötrofil sayısı, trombosit sayısı, D-dimer ve fibrinojen düzeyleri açısından gruplar arasında anlamlı fark saptanmadı. Obstetrik sonuçlar YBÜ hastalarında daha kötüydü; sezaryen doğum, preterm doğum ve maternal mortalite oranları daha yüksekti. Hastanede kalış süresinin medyanı YBÜ grubunda YBÜ dışı gruba göre anlamlı derecede daha uzundu [18 (çeyrekler arası aralık, 13,5-23) güne karşılık 5 (çeyrekler arası aralık, 3-8) gün; p<0,001]. Çok değişkenli analizde, başvuru anındaki solunum sayısı YBÜ yatışı için bağımsız ve güçlü bir öngördürücü olarak saptandı (düzeltilmiş olasılık oranı: 1,30; her 1 nefes/dak artış için; %95 güven aralığı: 1,21,41; p<0,001).

Sonuç: COVID-19 nedeniyle hastaneye yatırılan gebelerde YBÜ gereksinimi, obstetrik özellikler veya laboratuvar parametrelerinden ziyade akut solunumsal bozulma ile ilişkilidir. Başvuru anındaki solunum sayısı, kolay erişilebilir ve klinik olarak anlamlı bir belirteç olup, bu hasta grubunda erken risk sınıflandırmasına katkı sağlayabilir.

Anahtar kelimeler: COVID-19, gebelik, hipoksemi, solunum yetmezliği, yoğun bakım ünitesi

Introduction

Pregnancy is characterized by profound immunologic, respiratory, and hemodynamic adaptations that, while essential for fetal development, may simultaneously increase maternal vulnerability to severe respiratory infections such as coronavirus disease-2019 (COVID-19) (1-3). These changes include a shift toward Th2-dominant immunity, reduced cell-mediated immune responses, and altered cytokine regulation, potentially weakening maternal antiviral defense. Concurrently, pregnancy is associated with progressive reductions in functional residual capacity due to diaphragmatic elevation, increased oxygen consumption, and progesterone-mediated increases in minute ventilation, resulting in reduced respiratory reserve and a predisposition to rapid oxygen desaturation during pulmonary infections (2,4-6).

Although most pregnant women with COVID-19 experience mild disease, accumulating evidence indicates that pregnancy itself is an independent risk factor for adverse outcomes, including pneumonia, need for oxygen therapy, intensive care unit (ICU) admission, and mechanical ventilation (7-9). Several large international cohorts have demonstrated significantly higher rates of maternal morbidity and mortality among pregnant women with severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) infection compared with non-pregnant reproductive-age women. Comorbidities such as obesity, diabetes, chronic hypertension, and advanced maternal age further amplify susceptibility to respiratory failure via compounded inflammatory and metabolic dysregulation (10-12).

As the pandemic evolved, attention increasingly focused on the identification of early clinical and biochemical markers capable of predicting deterioration. Inflammatory markers—particularly C-reactive protein (CRP), ferritin, and D-dimer—were repeatedly associated with disease severity, reflecting the hyperinflammatory and prothrombotic state characteristic of severe COVID-19 (13,14). Respiratory parameters at presentation, including oxygen saturation and respiratory rate, have emerged as simple but powerful predictors of impending decompensation in adults; however, obstetric-specific data remain scarce, and the unique physiology of pregnancy may alter their predictive performance.

Despite extensive global research, pregnancy-specific risk stratification models applicable at the time of hospital admission remain limited, underscoring the need for simple and clinically applicable predictors. Most published cohorts include mixed populations or report limited respiratory or laboratory parameters; very few studies have incorporated comprehensive maternal, obstetric, and laboratory data simultaneously. For clinicians managing pregnant women with COVID-19, early identification of those at high risk for deterioration is crucial to guide triage decisions, allocate

monitoring resources, plan timely delivery when indicated, and coordinate care with anesthesiology and critical care teams.

Turkey, with its high-volume tertiary obstetric centers and centralized referral pathways, has cared for thousands of pregnant women with COVID-19 throughout the pandemic; however, detailed analyses of predictors of ICU admission in this population are lacking. The present study aimed to evaluate clinical, respiratory, inflammatory, and obstetric parameters associated with ICU admission in pregnant women hospitalized with COVID-19. In this context, clinically applicable pregnancy-specific risk stratification tools available at hospital admission remain limited, particularly those based on simple bedside parameters. By identifying early predictors measurable at presentation, this study seeks to contribute pregnancy-specific evidence to guide risk stratification and to support multidisciplinary maternal care during severe SARS-CoV-2 infection.

Materials and Methods

Study Design and Setting

This retrospective cohort study was conducted at a high-volume tertiary care referral center providing comprehensive obstetric and critical care services in İstanbul, Turkey. The study included pregnant women hospitalized with real-time reverse transcription polymerase chain reaction (RT-PCR)-confirmed COVID-19 infection between September 2020 and December 2021. The multidisciplinary care team, consisting of obstetricians, anesthesiologists, and intensive care specialists jointly managed the patients and contributed to data acquisition.

Study Population

All pregnant women admitted with symptomatic COVID-19 during the study period were screened for eligibility. Patients were categorized into two groups based on clinical management:

1. ICU group: Women who required admission to the ICU due to respiratory deterioration or hemodynamic instability, and

2. Non-ICU group: Women who were managed on standard obstetric wards.

Exclusion criteria included missing essential clinical data, admission for non-COVID-related conditions, or unconfirmed SARS-CoV-2 infection. A total of 402 women met the inclusion criteria, of whom 49 (12.2%) required ICU care.

Data Collection

Clinical data were extracted from electronic medical records and included:

- Demographic and obstetric characteristics: Maternal age, gravida, parity, in vitro fertilization (IVF) conception, COVID-19 vaccination status, gestational age at admission, and pre-existing medical conditions (chronic disease, hypertensive disorders, gestational diabetes).

- Clinical findings at presentation: Blood pressure, heart rate, respiratory rate, and oxygen saturation (SpO_2).

- Laboratory parameters obtained at admission: Hemoglobin, hematocrit, white blood cell count, neutrophils, lymphocytes, platelets, D-dimer, fibrinogen, procalcitonin and CRP.

- Obstetric outcomes: Mode of delivery, gestational age at birth, ongoing pregnancy at discharge, and preterm birth (<37 weeks).

- Maternal outcomes: ICU admission, length of stay and maternal mortality. Length of stay refers to ICU stay for ICU patients and to the total hospital stay for non-ICU patients.

Laboratory tests were performed using standardized, automated analyzers in the hospital's central laboratory. Patients with missing key laboratory or respiratory parameters at admission were excluded.

Outcomes

The primary outcome was ICU admission due to COVID-19-related respiratory failure or clinical deterioration. Secondary outcomes included mode of delivery, preterm birth, maternal mortality, and laboratory differences between ICU and non-ICU patients.

Patients were admitted to the ICU according to predefined institutional criteria, including the need for high-flow nasal oxygen therapy, non-invasive or invasive mechanical ventilation, persistent hypoxemia (SpO_2 <93% despite supplemental oxygen), signs of increased work of breathing, hemodynamic instability requiring vasopressor support, or clinical deterioration unresponsive to standard ward-based management.

Ethics

The study was approved by the Institutional Review Board of the University of Health Sciences Turkey, Başakşehir Çam and Sakura City Hospital (approval no: 149; date: 07/2021). The requirement for informed consent was waived due to the retrospective nature of the study. The study was conducted in accordance with the Declaration of Helsinki.

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics (version 29.0). Continuous variables were assessed for normality using the Shapiro-Wilk test. Normally distributed continuous variables are presented as mean ± standard deviation and were compared using Student's t-test, while non-normally distributed variables are presented as median (interquartile range) and were compared using the Mann-Whitney U test. Categorical variables were summarized as frequencies and percentages and compared using the chi-square or Fisher's exact test, as appropriate. A multivariable logistic regression model was constructed to identify independent predictors of ICU admission, with variables selected based on clinical relevance and statistical significance in univariable analyses. Adjusted odds ratios (ORs) with 95% confidence intervals (CIs) were calculated. Model performance was assessed using the area under the curve (AUC) and the Hosmer-Lemeshow goodness-of-fit test. Laboratory parameters were not included in the multivariable model to avoid overfitting and collinearity, given the limited number of ICU events. A two-sided p-value <0.05 was considered statistically significant.

Results

A total of 402 pregnant women with confirmed COVID-19 were included, of whom 49 (12.2%) required ICU admission. The mean maternal age was 29.6±5.7 years overall.

Women admitted to the ICU were significantly older than non-ICU patients (31.9±4.9 vs. 29.3±5.8 years, p=0.004). Gravidity and parity were comparable between the ICU and non-ICU groups. ICU patients also presented at a markedly earlier gestational age (29.7±5.7 vs. 33.0±7.9 weeks, p<0.001). Rates of chronic illness, hypertensive disorders, gestational diabetes, IVF pregnancies, and COVID-19 vaccination status did not differ significantly between groups (Table 1).

ICU patients presented with significantly more severe respiratory compromise than non-ICU patients. Respiratory rate was markedly elevated (22.7±5.6 vs. 18.4±3.2 breaths/min, p<0.001), and peripheral SpO_2 was significantly reduced (93.5±6.8% vs. 98.2±3.1%, p<0.001). These differences are shown in Figure 1 (respiratory rate distribution) and Figure 2 (oxygen saturation distribution), which both show clear separation between ICU and non-ICU groups. Blood pressure did not differ significantly between groups, whereas pulse rate was slightly higher among ICU patients (Table 2).

At hospital admission, patients requiring ICU care had significantly lower lymphocyte counts compared with non-ICU patients. Neutrophil and platelet counts did not differ significantly between groups. Inflammatory markers, including CRP and procalcitonin, were significantly higher among ICU patients, whereas hemoglobin, hematocrit, total leukocyte count, D-dimer, and fibrinogen levels were comparable between groups (Table 3).

Obstetric outcomes differed substantially between groups. Cesarean delivery occurred more frequently among ICU women (57.1% vs. 32.6%, p=0.001), whereas spontaneous

Table 1. Baseline demographic and clinical characteristics of pregnant women with COVID-19

Variable	ICU (n=49)	Non-ICU (n=353)	p-value
Age (years)	31.9±4.9	29.3±5.8	0.004
Gestational age at admission (weeks)	29.7±5.7	33.0±7.9	<0.001
Chronic disease (%)	18.3	11.9	0.21
Hypertensive disorder (%)	4.1	3.4	0.78
GDM (%)	10.2	7.9	0.54
IVF pregnancy (%)	4.1	6.2	0.56
COVID-19 vaccination (%)	12.2	17.6	0.41
Gravida, median (IQR)	2 (2-3.5)	2 (2-3)	0.63
Parity, median (IQR)	1 (1-2)	1 (0-2)	0.76

Values are presented as mean ± standard deviation, median (interquartile range), or n (%), as appropriate. Comparisons for continuous variables were performed using Student's t-test or Mann-Whitney U test, as appropriate. Categorical variables were compared using the chi-square or Fisher's exact test. ICU: Intensive care unit, GDM: Gestational diabetes mellitus, IVF: In vitro fertilization, COVID-19: Coronavirus disease-2019, IQR: Interquartile range

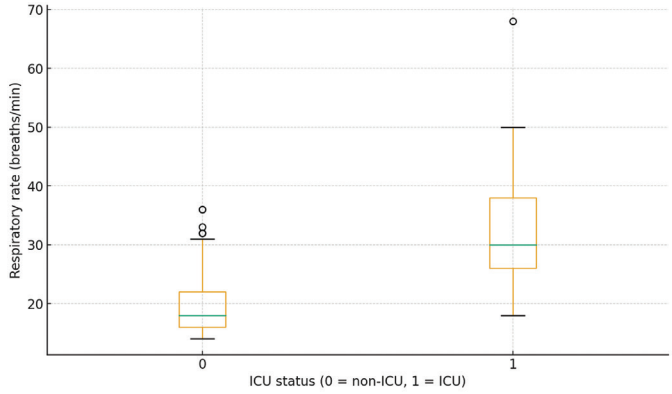

Figure 1. Respiratory rate according to ICU status. Boxplot showing respiratory rate distributions among ICU and non-ICU patients. ICU patients demonstrated significantly higher respiratory rates at admission

ICU: Intensive care unit

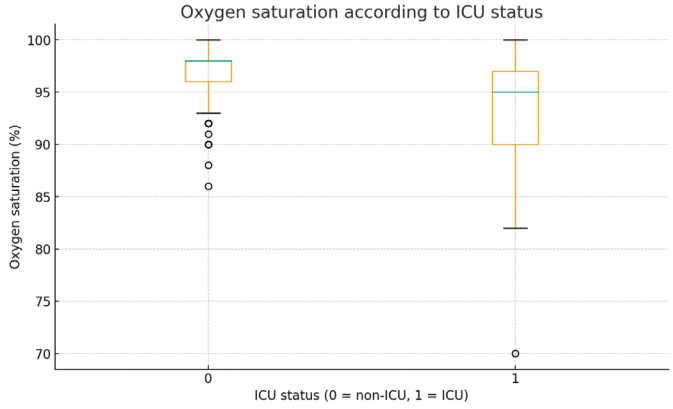

Figure 2. Peripheral oxygen saturation at admission according to ICU status. Boxplot illustrating significantly lower oxygen saturation in patients who required ICU care compared with those managed on the general ward

ICU: Intensive care unit

vaginal birth was significantly more common among non-ICU women. ICU admission was associated with earlier delivery (34.2±3.7 vs. 37.6±2.9 weeks, p<0.001) and a markedly higher rate of preterm birth (64.6% vs. 28.2%, p<0.001). Maternal mortality occurred exclusively in the ICU cohort (12.2% vs. 0%, p<0.001).

Patients admitted to the ICU had substantially longer hospital stays than non-ICU patients [median 18 (IQR, 13.5-23) vs. 5 (IQR, 3-8) days, p<0.001] (Table 4).

In multivariable logistic regression analysis, respiratory rate at admission emerged as the strongest independent predictor of ICU admission among pregnant women hospitalized with COVID-19 (adjusted OR 1.30 per 1 breath/min increase; 95% CI 1.20-1.41; p<0.001) (Table 5). After adjustment for maternal age and gestational age at admission, oxygen saturation was not independently associated with ICU admission. Maternal age showed a borderline association with ICU admission, whereas gestational age at admission was not significantly associated with ICU admission.

Table 2. Respiratory indices and oxygenation parameters at presentation

	ICU	Non-ICU	p-value
Oxygen saturation, SpO_2 (%)	93.5±6.8	98.2±3.1	**<0.001**
Respiratory rate (breaths/min)	22.7±5.6	18.4±3.2	**<0.001**
Pulse (beats/min)	103±16	96±14	**0.001**
Systolic BP (mmHg)	118±14	116±13	0.33
Diastolic BP (mmHg)	72±10	71±9	0.48

Values are given as mean ± standard deviation. SpO_2: Peripheral oxygen saturation, BP: Blood pressure, ICU: Intensive care unit

In an exploratory analysis, a logistic regression model incorporating respiratory rate and oxygen saturation at admission demonstrated excellent discriminatory ability for predicting ICU requirement, yielding an AUC of 0.90 (Figure 3). Using Youden's index, the optimal respiratory rate cut-off for predicting ICU admission was identified as ≥25 breaths/min, providing a sensitivity of 79.6% and a specificity of 86.5%. This threshold offers clinically meaningful discrimination for early risk stratification on hospital admission.

Discussion

In this retrospective cohort study of pregnant women hospitalized with COVID-19, we evaluated clinical, respiratory, laboratory, and obstetric factors associated with ICU admission. The principal finding of our study was that respiratory rate at admission emerged as the strongest independent predictor of ICU requirement,

Table 3. Laboratory parameters at admission in ICU and non-ICU patients

	ICU (n=49) median (IQR)	Non-ICU (n=353) median (IQR)	p-value
Hemoglobin (g/dL)	11.05 (10.70-12.07)	11.40 (10.55-12.40)	0.402
Hematocrit (%)	33.20 (31.55-36.00)	34.80 (32.15-37.20)	0.092
White blood cell count (×109/L)	8.49 (5.84-10.87)	8.27 (6.37-10.31)	0.776
Neutrophils (×109/L)	6.71 (4.77-8.49)	6.18 (4.62-7.76)	0.255
Lymphocytes (×109/L)	1.01 (0.81-1.38)	1.45 (0.98-1.88)	0.021
Platelets (×109/L)	194.00 (167.00-234.00)	201.00 (163.00-246.50)	0.774
C-reactive protein (mg/L)	105.75 (50.38-134.00)	27.70 (7.97-59.80)	<0.001
D-dimer (mg/L)	1.42 (0.96-1.91)	1.25 (0.87-2.08)	0.699
Procalcitonin (ng/mL)	0.15 (0.10-0.28)	0.08 (0.05-0.14)	0.002
Fibrinogen (mg/dL)	525.00 (445.00-619.00)	495.50 (426.25-573.00)	0.086

Values are presented as median (interquartile range). Group comparisons were performed using the Mann-Whitney U test. ICU: Intensive care unit, IQR: Interquartile range

Table 4. Obstetric and maternal outcomes according to ICU requirement

Outcome	ICU (n=49)	Non-ICU (n=353)	p-value
Cesarean delivery (%)	57.1	32.6	0.001
Vaginal delivery (%)	20.4	39.5	0.005
Ongoing pregnancy at discharge (%)	22.4	27.9	0.21
Preterm birth <37 weeks (%)	64.6	28.2	<0.001
Gestational age at delivery (weeks)	34.2±3.7	37.6±2.9	<0.001
Length of hospital stay (days), median (IQR)	18 (13.5-23)	5 (3-8)	<0.001
Maternal mortality (%)	12.2	0	<0.001

Values are expressed as mean ± standard deviation, median (interquartile range), or n (%), as appropriate. Comparisons were performed using the chi-square or Fisher's exact test for categorical variables and the Student's t-test or Mann-Whitney U test for continuous variables, as appropriate. Length of stay refers to ICU stay for ICU patients and total hospital stay for non-ICU patients. ICU: Intensive care unit, IQR: Interquartile range

Table 5. Multivariable logistic regression analysis for ICU admission

	Adjusted OR	95% CI	p-value
Oxygen saturation (per 1% increase)	1.00	0.88-1.14	0.951
Respiratory rate (per 1 breath/min increase)	1.30	1.20-1.41	<0.001
Maternal age (per 1 year increase)	1.08	1.00-1.17	0.063
Gestational age at admission (per 1 week increase)	1.01	0.96-1.07	0.677

Gestational age recorded as weeks and days was parsed (W and D) and modeled as weeks + days/7 in regression analyses. Adjusted ORs with 95% CIs are shown. ICU: Intensive care unit, CI: Confidence interval, OR: Odds ratio

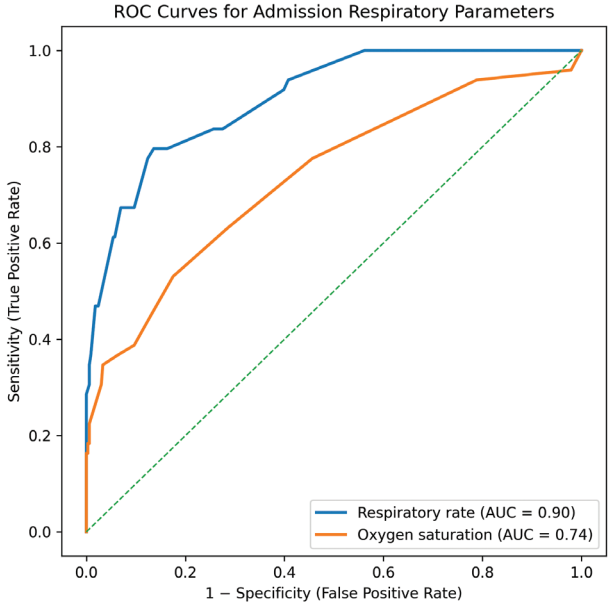

Figure 3. ROC curve illustrating the discriminatory performance of respiratory rate and oxygen saturation measured at hospital admission for predicting ICU requirement. Respiratory rate demonstrated excellent discrimination (AUC=0.90). An optimal cut-off value of 25 breaths/min provided 79.6% sensitivity and 86.5% specificity for predicting ICU admission, while oxygen saturation showed moderate discrimination (AUC=0.74)

AUC: Area under the curve, ROC: Receiver operating characteristic, ICU: Intensive care unit

whereas oxygen saturation, maternal age, gestational age, and inflammatory biomarkers did not retain independent significance after multivariable adjustment. This finding highlights the importance of early bedside respiratory assessment in pregnant patients with SARS-CoV-2 infection (15).

Consistent with previous studies, pregnant women requiring ICU care presented with more severe respiratory compromise at hospital admission, including higher respiratory rates and lower oxygen saturation levels (16,17). However, in the adjusted model, oxygen saturation was no longer independently associated with ICU admission, while respiratory rate remained a robust predictor. This observation is clinically plausible, as respiratory rate reflects increased work of breathing and early respiratory distress, often preceding overt hypoxemia. In pregnancy, physiological respiratory adaptations may further limit the discriminatory value of oxygen saturation alone, rendering respiratory rate a more sensitive indicator of impending clinical deterioration (18).

Inflammatory biomarkers, including CRP and procalcitonin, were significantly elevated among ICU patients in univariable analyses, consistent with previous reports linking systemic inflammation to severe COVID-19 (16,19). Nevertheless, these biomarkers did not independently

predict ICU admission after adjustment for respiratory parameters. This suggests that inflammatory markers primarily reflect disease severity rather than directly driving the need for intensive care in pregnant patients with COVID-19 (20). Although vaccination status did not differ significantly between ICU and non-ICU groups, overall vaccination rates in the cohort were low, reflecting limited vaccine availability during the early phases of the pandemic. This likely reduced the ability to detect a protective effect of vaccination in this study.

Gestational age at admission was lower among ICU patients in unadjusted analyses; however, this association did not persist in multivariable analyses. Similarly, maternal age demonstrated only a borderline association with ICU admission. These findings indicate that acute respiratory compromise, rather than baseline maternal or obstetric characteristics, is the principal determinant of ICU requirement in pregnant women with COVID-19 (17,18).

Adverse obstetric outcomes, including higher rates of cesarean delivery and preterm birth, were more frequent among women admitted to the ICU, in line with previous reports (15,16). These outcomes are likely driven by maternal clinical deterioration and iatrogenic delivery decisions for maternal indications rather than a direct effect of SARS-CoV-2 infection on pregnancy itself (4). The higher rate of preterm birth observed in ICU patients likely reflects iatrogenic delivery decisions driven by maternal clinical deterioration rather than spontaneous preterm labor, underscoring the indirect impact of severe maternal COVID-19 on obstetric outcomes.

Furthermore, the observed maternal mortality rate among ICU patients was higher than that in many contemporary cohorts and likely reflected the severity of respiratory failure, delayed presentation, and the predominance of early pandemic variants prior to widespread vaccination and standardized treatment protocols.

The strengths of this study include a relatively large cohort from a tertiary referral center, a well-defined ICU population, and a comprehensive evaluation of clinical and respiratory parameters using multivariable analysis. Through an emphasis on readily available bedside measurements, our findings offer direct clinical applicability for early risk stratification in pregnant women with COVID-19.

Study Limitations

This study has several limitations. Its retrospective design may have introduced selection bias. Clinical management strategies for COVID-19 evolved substantially during the study period; these changes included the introduction of corticosteroids, anticoagulation protocols, and antiviral therapies. In addition, changing viral variants and evolving treatment protocols over time could not be fully accounted for in the analysis, and therefore may have influenced clinical outcomes. Furthermore, length of stay was defined as ICU stay for critically ill patients and as total hospital stay for non-ICU patients, which may limit direct comparison of hospitalization duration between groups.

A respiratory rate of 25 breaths/min or higher at presentation represents a practical bedside threshold that identifies pregnant patients at high risk for clinical deterioration, supporting its integration into early triage algorithms for COVID-19 in pregnancy.

Conclusion

Our findings demonstrate that respiratory rate at admission is a powerful and independent predictor of ICU admission among pregnant women hospitalized with COVID-19, whereas laboratory biomarkers and baseline obstetric characteristics show limited independent prognostic value in multivariable analysis. Incorporating respiratory rate into early triage algorithms may improve timely identification of pregnant patients at risk for critical illness.

Ethics

Ethics Committee Approval: The study was approved by the Institutional Review Board of the University of Health Sciences Turkey, Başakşehir Çam and Sakura City Hospital (approval no: 149; date: 07/2021).

Informed Consent: The requirement for informed consent was waived due to the retrospective nature of the study.

Footnotes

Authorship Contributions

Surgical and Medical Practices: K.O.Ç., G.H.A., E.Z., T.S., R.A., İ.A., Concept: G.H.A., E.Z., T.S., R.A., İ.A., Design: G.H.A., İ.A., Data Collection or Processing: K.O.H., E.Z., T.S., R.A., Analysis or Interpretation: K.O.Ç., G.H.A., İ.A., Literature Search: K.O.Ç., Writing: K.O.Ç.

Conflict of Interest: No conflict of interest was declared by the authors.

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