ORIGINAL PAPER

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The long-term postpartum anxiety and depression outcomes for mothers with COVID-19 during pregnancy
Ansiedad y depresión posparto a largo plazo de las madres con COVID-19 durante el embarazo

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ABSTRACT

The COVID-19 pandemic is associated with negative mental outcomes in the early postpartum period. **Objective:** To assess the long-term postpartum mental health of women infected with COVID-19 during pregnancy. **Methods:** Cross-sectional study in 101 pregnant women who gave birth in a tertiary center during the COVID-19 pandemic, between March 31, 2020, and November 30, 2021. The pregnant women were classified into 2 groups as COVID-19 positive (study group, n=52) and COVID-19 negative (control group, n=49). Sociodemographic and obstetric data were collected by questionnaire in the early (≤6 months) and late (6-18 months) postpartum periods. Beck Depression Inventory (BDI) and Beck Anxiety Inventory (BAI) scores were calculated by analysis of the participants' data. **Results:** The mean BDI score and the rate of depression (BDI score >13) in COVID-19 positive patients were higher in the early postpartum period than in the late postpartum period. According to multivariate linear regression analysis, there was a significant correlation between the BDI score of COVID-19 patients and educational level and employment status. According to the same analysis, there was a significant correlation between the BAI score of COVID-19 patients and spousal support, marital relationship, and birth-related diseases. We found that COVID-19 positive and COVID-19 negative patients had similar BDI and BAI scores in the early (≤6 months) and late (6-18 months) postpartum periods. In addition, rates of anxiety and depression were similar in both groups at the same postpartum periods. **Conclusion:** In our study, COVID-19 infection in pregnancy had no significant additional impact on long-term postpartum maternal mental health.
Key words: COVID-19, Pregnancy, Postpartum, Depression, Anxiety, Beck anxiety inventory, Beck depression inventory

RESUMEN

La pandemia de COVID-19 se asocia con resultados mentales negativos en el período posparto temprano. **Objetivo.** Evaluar la salud mental posparto a largo plazo de las mujeres infectadas con COVID-19 durante el embarazo. **Métodos.** Estudio transversal en 101 gestantes que dieron a luz en un centro terciario durante la pandemia de COVID-19, entre el 31 de marzo de 2020 y el 30 de noviembre de 2021. Se clasificó a las gestantes en 2 grupos como COVID-19 positivo (grupo de estudio, n=52) y COVID-19 negativo (grupo control, n=49). Se recogieron datos sociodemográficos y obstétricos mediante un cuestionario en los períodos posparto temprano (≤6 meses) y tardío (6 a 18 meses). Se calculó la puntuación del Inventario de Depresión de Beck (IDB) y del Inventario de Ansiedad de Beck (IAB) mediante el análisis de los datos de las participantes. **Resultados.** La puntuación media del IDB y la tasa de depresión (puntuación del IDB >13) en las pacientes con COVID-19 positivo fueron mayores en el período posparto temprano que en el tardío. Según el análisis de regresión lineal multivariante, existió una correlación significativa entre la puntuación IDB de las pacientes con COVID-19 y el nivel educativo y la situación laboral. Según el mismo análisis, existió una correlación significativa entre la puntuación del IAB de los pacientes con COVID-19 y el apoyo del cónyuge, la relación marital y las enfermedades relacionadas con el nacimiento. Se encontró que las pacientes con COVID-19 positivo y COVID-19 negativo tenían puntuaciones IDB e IAB similares en los periodos postparto temprano (≤6 meses) y tardío (6-18 meses). Además, las tasas de ansiedad y depresión fueron similares en ambos grupos en los mismos períodos posparto. **Conclusión.** En nuestro estudio, la infección por COVID-19 en el embarazo no tuvo un impacto adicional significativo en la salud mental materna en el posparto a largo plazo.
Palabras clave. COVID-19, Embarazo, Puerperio, Depresión, Ansiedad, Inventario de ansiedad de Beck, Inventario de depresión de Beck

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INTRODUCTION

Coronavirus disease 2019 (COVID-19) has been one of the most important global problems for more than two years[1]. Until December 2021, more than 5 million COVID-19 deaths have been identified worldwide[2]. The COVID-19 pandemic has greatly affected the entire world. It has severely damaged the mental and physical health of millions of people.

The World Health Organization (WHO) reported that 10% of pregnant women and 13% of recent mothers suffer from depression[3]. It has been found in the literature that the COVID-19 pandemic caused a statistically significant increase in maternal anxiety, depression, or both[4]. Maternal depression and anxiety can lead to adverse pregnancy, fetal, and infant outcomes, such as preterm birth[5,6], low birth weight, fetal growth restriction[6,7], and postnatal complications[8]. It has also been associated with hypertension, pre-eclampsia, and gestational diabetes[9]. Thus, maternal mental illness is a serious public health problem.

Uncertainties about COVID-19 infection (vertical transmission, effects on the fetus, mode of delivery and postnatal care, quarantine, long-term sequelae) may create additional mental risks for these mothers with other adverse effects of the pandemic (economic losses, social isolation, confinement). COVID-19 infected women are concerned not only for their own health, but also for their unborn babies. It has also been suggested that quarantine has negative psychological consequences in the latter period[10].

There are many studies investigating the impact of the COVID-19 pandemic on the mental health of pregnant women and mothers in the early postpartum period. We wondered about the long-term mental health outcomes of mothers who had a COVID-19 infection during their pregnancy. However, to our knowledge, no study has investigated whether these women have long-term psychological sequelae. The aim of this study is to assess the long-term postpartum mental health of women infected with COVID-19 during pregnancy.

METHODS

This cross-sectional research was conducted at the Department of Obstetrics and Gynecology, University of Health Sciences, Tepecik Training and Research Hospital, a tertiary center in Izmir, Turkey. Ethical approval was obtained from the Hospital Ethics Committee (approval number: 2021/ 03-06) and informed consent was obtained from all research participants after the description of the study. Data were collected using an anonymous face-to-face (or telephone) questionnaire. All procedures were performed in accordance with the Declaration of Helsinki.

Inclusion criteria were proficiency in reading, writing and comprehension in Turkish of women over 18 years of age who had a single delivery in our hospital between March 31, 2020, and November 30, 2021. A Structured Clinical Interview for DSM-5 (SCID-5) was administered to all patients by a psychiatrist to screen for psychiatric symptoms. Exclusion factors were the existence of antepartum psychiatric disorders, severe stress and trauma during pregnancy, neurological diseases, illicit drug or methadone use, history or family history of psychiatric disorder, presence of chronic and autoimmune diseases, fetal or neonatal death, and being a carrier of an abnormal fetus. Women who were not mentally competent to answer the survey questions were excluded from the study. Also, women who returned incomplete questionnaires were excluded.

All participants were screened for severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) by oropharyngeal and nasopharyngeal swab via real-time quantitative polymerase chain reaction (RT-qPCR) for an obstetric complaint during their pregnancy. The total number of patients who underwent the test during the study period was 180. Of these, 90 patients were positive (study group) and 90 patients were negative (control group). Our control group was formed by matching age and weeks of gestation. Of the positive patients, 15 gave birth in another hospital, 7 of them did not want to participate in the research, 8 gave insufficient answers to the surveys, 8 did not know Turkish. The study group consisted of 52 SARS-CoV-2 positive postpartum women who gave birth in our hospital during

the pandemic period. Of the negative patients, 9 gave birth at another hospital, 15 of them did not want to participate in the investigation, 10 did not respond sufficiently to the surveys, 7 did not speak Turkish. 49 SARS-CoV-2 negative postpartum women who delivered in our hospital during the pandemic period constituted our control group. (Figure 1).

All participants were surveyed in the early (≤6 months) and late (6-18 months) postpartum periods. The survey was not conducted immediately after delivery. In COVID-positive and -negative patients, the time of the interview in the early postpartum period was, on average, 4.4 and 4.8 months, respectively. In COVID positive and negative patients, the timing of the late postpartum interview averaged 11.4 and 11 months, respectively.

Patients who delivered at our hospital were reached by telephone according to the contact reference available at the hospital. They were provided with information about the study. Those who agreed to participate in the study were invited to the hospital. Written informed consent was obtained from the patients who came to the hospital before the face-to-face interview, and the questionnaires were administered by an obstetrics and gynecology resident. We conducted this study at a time when the 1st,

2nd, and 3rd waves of the pandemic occurred in our country. For this reason, some patients were hesitant to come to the hospital and the questionnaires were administered by an obstetrics and gynecology resident by telephone. Since most of our patients did not have an e-mail address, online surveys could not be conducted. All questions in the questionnaire were mandatory to avoid loss of data. The Beck Depression Inventory and Beck Anxiety Inventory were used to assess mental health status.

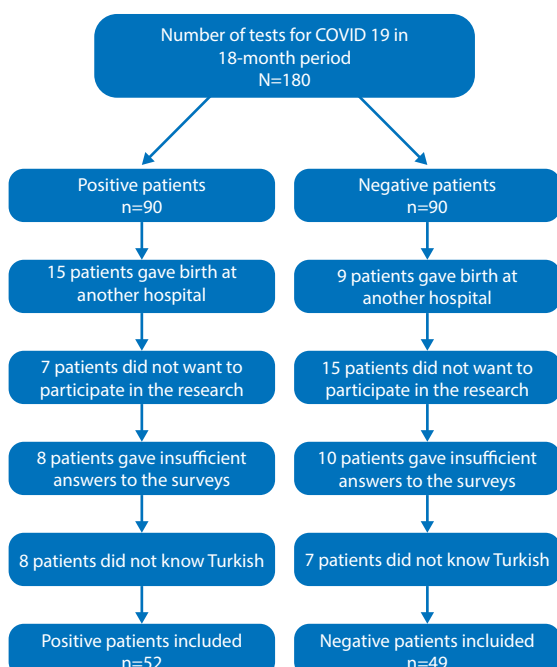## THE BECK DEPRESSION INVENTORY (BDI)

The original BDI was first developed in 1961[11]. There are three versions of BDI; the original BDI, first published in 1961 and later revised as BDI-1A in 1978, and the BDI-II published in 1996[12]. It was validated in our country by Hisli[13]. The BDI consists of 21 items. A 4-point scale indicates the degree of severity. The overall score is an arithmetic sum of the ratings of the 21 symptoms scored on a scale ranging from 0 to 63. The BDI-II is interpreted as follows: minimal range = 0–13, mild depression = 14–19, moderate depression = 20–28, and severe depression = 29–63. Postpartum depression (PPD) was defined as an BDI score of ≥13[14].

THE BECK ANXIETY INVENTORY (BAI)

Anxiety was also assessed using the BAI. The BAI was designed by Beck et al[15]. The Turkish version of the BAI was developed by Ulusoy et al[16]. The BAI has a total of 21 items. Responses are rated on a 4-point Likert scale and range from 0 (not at all) to 3 (severely). The total score ranges from 0–63. The overall score is an arithmetic sum of the 21 symptom scores. A total score of 0–7 is considered minimal range, 8–15 is mild, 16–25 is moderate, and 26–63 is severe. Postpartum anxiety (PPA) was defined as a BAI score of ≥7[17].

Telephone administration of the survey has proven to be a good alternative for clinical practice and research[18]. Detailed sociodemographic characteristics were recorded for each participant, including age, gravity, parity, mode of delivery, education and income levels, employment, marital relationship, household size, comorbidities, migration status, marital status, occupational status, smoking in pregnancy, breastfeeding, obstetric history, social support, wanted or

FIGURE 1. FLOW CHART OF PARTICIPANTS

Tayfun Vural, Burak Bayraktar, Suna Yildirim Karaca, Kadir Ascibasi, Nilufer Saygili, Ozan Odabas, Gulsum Damla Onal Erdemir, Ozgun Akbas, Yasemin Eser, Muge Selcuk, Ozlem Oruc, Ozge Kilinc

unwanted pregnancy. Obstetric characteristics were also evaluated, such as preterm birth, pre-eclampsia, diabetes, obstetric hemorrhage, obstetric hysterectomy, and placenta previa.

STATISTICAL ANALYSIS

The Statistical Package for Social Sciences v26.0 (IBM® SPSS® Statistics, New York, USA) was used for data analysis. Data are presented as mean ± standard deviation (SD) or number (n) or percent (%). Normality of distributions was assessed with the Shapiro-Wilk test and histogram plots. Student's t-test was used to compare data with the normal distribution and data were presented as mean ± SD. Categorical variables were compared with the chi-square test. Multivariate logistic regression analysis was used to show the relationship between sociodemographic and clinical characteristics and BDI and BAI scores of SARS-Cov-2 positive women. Results with $p<0.05$ were considered significant.

RESULTS

A total of 52 COVID-19 positive (study group) and 49 COVID-19 negative (control group) pregnant women were analyzed. The sociodemographic characteristics of both groups are shown in Table 1. Mean maternal age was 27.4±5.6 years. Most of the women were between 19-35 years old, married and unemployed. The education level of most women was illiterate/primary and high school (Table 1).

The mean gestational age at birth was 37.6±2.8 weeks in the SARS-CoV-2 (+) group and 38±1.8 in the SARS-CoV-2 (-) group, which was statistically similar. Likewise, mean birth weight was similar between the groups. In both the COVID-19 positive and negative groups, the most frequent complications were gestational diabetes and hypertensive disease of pregnancy (Table 2).

The BDI and BAI scores of COVID-19 positive women in the early (≤6 months) and late (6-18 months) postpartum periods were compared. The mean BDI score and rate of postpartum depression (BDI score >13) in COVID-19 positive patients were higher in the early than in the late postpartum period (p=0.013, p=0.040, respectively). The mean BAI score and the rate of postpartum anxiety (BAI score >7) in COVID-19 pos-

TABLE 1. DEMOGRAPHIC CHARACTERISTICS OF THE PARTICIPANTS *

Age (years)	**27.4±5.6**
Maternal age ≤19 (years)	6 (5.9%)
Maternal age ≥35 (years)	12 (11.9%)
Education level	
Illiterate/Primary school	31 (30.7%)
Middle school	33 (32.7%)
High school	21 (20.8%)
University and above	16 (15.8%)
Migration status	**13 (12.9%)**
Marital status	
Single	0
Married/cohabitant	99 (98%)
Divorced/separated	2 (2%)
Employment status	
Unemployment	87 (86.1%)
Employed	14 (13.9%)
Student	0
Partially employed	0
Pregnancy scheduling	
Planned pregnancy	82 (81.2%)
Unintended pregnancy	19 (18.8%)
Spousal support	**96 (95%)**
Social support	**31 (30.7%)**
Household size	
Nuclear family	82 (81.2%)
Non-nuclear family	19 (18.8%)
Perceived family income sufficiency	
Not enough	1 (1%)
Just enough	55 (54.5%)
More than enough	45 (44.5%)
Family socio-economic status	
Low	38 (37.6%)
Middle	61 (60.4%)
High	2 (2%)
Marital relationship	
Poor	5 (5%)
Moderate	18 (17.8%)
Satisfying	78 (77.2%)
Breastfeeding	**72 (71.3%)**
Smoking	
During pregnancy	23 (22.8%)
At breastfeeding	23 (22.8%)
Both in pregnancy and breastfeeding	23 (22.8%)
None	78 (77.2%)

* Data are reported as mean ± standard deviation (SD) or number (n), percent (%)

itive patients were similar in the early and late postpartum period (p=0.645, p=0.975, respectively) (Table 3).

A multiple logistic regression analysis was performed to assess the relationship between sociodemographic and clinical characteristics and BDI scores of COVID-19 positive women. In ad-

TABLE 2. OBSTETRIC DATA OF THE PARTICIPANTS.

	SARS-CoV-2 (+) n=52	SARS-CoV-2 (-) n=49	p
Parity (n,%)			**0.201**
Nulliparous	20 (38.5%)	13 (26.5%)	
Multiparous	32 (61.5%)	36 (73.5%)	
Mode of delivery (n,%)			**0.109**
Vaginal	8 (15.4%)	14 (28.6%)	
Cesarean section	44 (84.6%)	35 (71.4%)	
Pregnancy related disease (n,%)			**0.379**
Gestational diabetes	6 (11.6%)	7 (14.3%)	
Hypertensive disease of pregnancy	6 (11.6%)	4 (8.2%)	
Cholestasis	1 (1.9%)	0	
Hypothyroidism	0	1 (2%)	
Gestational thrombocytopenia	1 (1.9%)	0	
Rh incompatibility	0	1 (2%)	
Delivery related disease			**0.406**
Wound infection	1 (1.9%)	1 (2%)	
Atonia	1 (1.9%)	0	
Gestational age at birth (weeks) (mean±SD)	**37.6±2.8**	**38±1.8**	**0.574**
Birth weight (grams) (mean±SD)	**3064.2±512**	**3082.2±696**	**0.880**

TABLE 3. COMPARISON OF BDI AND BAI SCORES OF SARS-CoV-2 POSITIVE WOMEN AT POSTPARTUM ≤6 MONTHS AND 6-18 MONTHS PERIOD.

	Postpartum ≤6 months n=14	Postpartum 6-18 months n=38	p
BDI scores (mean±SD)	14±7	9±10	0.013
BDI >13 (n,%)	7 (50%)	8 (21.1%)	0.040
BAI scores (mean±SD)	8±6	9±10	0.645
BAI >7 (n,%)	5 (35.7%)	16 (42.1%)	0.975

dition, a multivariate linear regression analysis to predict the BDI score using the variables in the table. As a result of the analysis, the model was significant with $F_{(20, 31)} = 1.50$, $p=0.039$, and 49% of the variance in the dependent variable (adjusted $R^2=49$) was found to be explained by the independent variables. According to the model, education level and employment status significantly affected the BDI score of COVID-19 positive women, while other variables had no significant effect ($p=0.016$, $p=0.034$, respectively) (Table 4). A similar analysis was done for the BAI score in COVID-positive women and, as a result, the model was significant, with $F_{(20, 31)} = 1.99$, $p=0.041$, and 28% of the variance in the dependent variable (adjusted $R^2=28$) was found to be explained by the independent variables. According to the model, spousal support, marital relationship and childbirth-related illness significantly affected BAI score in COVID-19 positive women, while other variables had no significant effect ($p=0.012$, $p=0.001$, $p=0.037$) (Table 5).

BAI and BDI scores and levels of anxiety and depression were similar in the early (< 6 months) and late (6-18 months) postpartum periods of COVID-19 positive and COVID-19 negative patients (Table 6).

DISCUSSION

To our knowledge, this is the first study to investigate the postpartum long-term psychological outcomes of mothers who had COVID-19 during pregnancy. The principal finding of the study is that COVID-19 infection in pregnancy had no significant additional impact on long-term postpartum maternal mental health. COVID-19-positive and COVID-19-negative patients were found to have similar BAI and BDI scores and rates of anxiety and depression in the early (≤6 months) and late (6-18 months) postpartum. It was determined that COVID-19 infection did not leave long-term permanent psychological sequelae after delivery.

In previous studies, Peng et al. reported that there were no statistically significant differences in rates of depression and anxiety between COVID-19 positive and negative mothers in

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TABLE 4. Multiple logistic regressions assessing the relationship between socio-demographic and clinical characteristics and BDI scores of the SARS-CoV-2 positive women.

	B	Standard error	β	t	p
Age (years)	-0.303	0.507	-0.176	-0.598	0.554
Maternal age ≤19 (years)	-12.312	8.169	-0.257	-1.507	0.142
Maternal age ≥35 (years)	-2.247	7.989	-0.078	-0.281	0.780
Education level	-4.581	1.803	-0.517	-2.541	0.016
Migration status	-0.565	5.176	-0.018	-0.109	0.914
Marital status	5.922	9.461	0.088	0.626	0.534
Employment status	3.491	1.573	0.335	2.220	0.034
Pregnancy status	3.760	5.291	0.139	0.711	0.483
Spousal support	17.160	12.970	0.255	1.323	0.196
Social support	0.557	3.550	0.027	0.157	0.876
Household size	-2.992	4.524	-0.104	-0.661	0.513
Perceived family income sufficiency	4.950	4.505	0.268	1.099	0.280
Family socio-economic status	5.751	5.036	0.300	1.142	0.262
Marital relationship	7.664	4.048	0.354	1.893	0.068
Breastfeeding	-5.674	2.923	-0.296	-1.941	0.061
Smoking	2.083	3.214	0.102	0.648	0.522
Parity	-6.078	3.907	-0.321	-1.556	0.130
Mode of delivery	1.638	4.186	0.064	0.391	0.698
Pregnancy related disease	0.921	3.396	0.041	0.271	0.788
Delivery related disease	12.762	7.741	0.266	1.649	0.109
Gestational age at births (weeks)	-0.146	0.601	-0.044	-0.243	0.809

TABLE 5. Multiple logistic regressions assessing the relationship between socio-demographic and clinical characteristics and BAI scores of the SARS-CoV-2 positive women.

	B	Standard error	β	t	p
Age (years)	-0.101	0.466	-0.059	-0.217	0.830
Maternal age ≤19 (years)	-7.736	7.495	-0.163	-1.032	0.310
Maternal age ≥35 (years)	-4.704	7.330	-0.165	-0.642	0.526
Education level	-0.764	1.654	-0.087	-0.462	0.647
Migration status	-4.593	4.749	-0.148	-0.967	0.341
Marital status	4.882	9.370	0.073	0.521	0.605
Employment status	2.700	1.443	0.262	1.872	0.071
Pregnancy status	5.401	4.855	0.202	1.114	0.274
Spousal support	31.675	11.900	0.477	2.262	0.012
Social support	-3.561	3.257	-0.177	-1.093	0.283
Household size	-2.955	4.151	-0.103	-0.782	0.482
Perceived family income sufficiency	2.859	4.134	0.157	0.692	0.494
Family socio-economic status	-0.153	4.620	-0.008	-0.033	0.974
Marital relationship	13.277	3.714	0.620	3.575	0.001
Breastfeeding	-4.571	2.682	-0.239	-1.686	0.102
Smoking	2.164	2.949	0.107	0.734	0.469
Parity	-2.334	3.585	-0.124	-0.651	0.520
Mode of delivery	-3.316	3.841	-0.131	-0.864	0.394
Pregnancy related disease	-1.903	3.116	-0.085	-0.611	0.546
Delivery related disease	15.457	7.102	0.326	2.176	0.037
Gestational age at births (weeks)	-0.036	0.551	-0.011	-0.066	0.948

Table 6. Comparison of BDI and BAI scores between SARS-CoV-2 positive and negative women at postpartum ≤6 months and 6-18 months period.

	SARS-CoV-2 (+) ≤6 months n=14	SARS-CoV-2 (-) ≤6 months n=7	p	SARS-CoV-2 (+) 6-18 months n=38	SARS-CoV-2 (-) 6-18 months n=42	p
BDI scores (mean±SD)	14±7	8±6	0.243	9±10	10±8	0.289
BDI >13 (n,%)	7 (50%)	1 (14.3%)	0.112	8 (21.1%)	13 (31%)	0.314
BAI scores (mean±SD)	8±6	4±3	0.097	9±10	8±8	0.400
BAI >7 (n,%)	5 (35.7%)	1 (14.3%)	0.305	16 (42.1%)	18 (42.8%)	0.945

the early postpartum period (≤ 2 months)[19]. Suárez-Rico et al also found no statistically significant differences in depression and anxiety in women who were COVID-19 positive in the early postpartum period (≤ 3 months) compared to those who were negative[20]. Kotabagai et al. determined that COVID-19-positive mothers were no different from non-COVID-mothers in terms of anxiety and depression[21].

There are several possible explanations for the lack of difference in mental health between COVID-19 positive and negative mothers in the early and late terms trimesters. Most COVID-19-positive mothers are asymptomatic or have a mild illness. For the most part, COVID-19-positive patients recover completely, understand that their baby is healthy, and uncertainty about their health and their baby's health disappears. Most family members stay at home and can be supportive to the mother. A close bond between mother and baby may also be a protective factor for the mother against depression.

In contrast to our study, there are also publications reporting that the rate of depression or stress in COVID-19-positive mothers is higher than in COVID-19-negative mothers[22-24]. As all these studies pertain only to the early period, they may contain different results than ours.

The U.S. Centers for Disease Control and Prevention (CDC) has considered pregnant and postpartum women as vulnerable to the COVID-19 pandemic[25]. These women have been estimated to be a high-risk population[26]. In our study, depression scores and depression rates in COVID-19-positive women in the early postpartum period (≤ 6 months) were statistically significantly higher than values in the late period (6-18 months). Kotabagai et al. showed that depression scores in COVID-19-positive mothers peak at the time of pandemic deaths, but decrease later as more data become known[21]. López-Morales

et al. found that depression, which increased in the perinatal period early in the pandemic, decreased over time[27].

Anxiety is an important mental problem during pregnancy and postpartum. Pandemic COVID-19 is uncontrollable life-ruining stress. During the COVID-19 pandemic, worries and fears are felt because of the risk of COVID-19 infection or hospitalization, possible vertical transmission, quarantine period, economic losses, insufficient supplies, insufficient information, lack of vaccines, being unaccompanied at delivery, and uncertainty[10]. These concerns and fears further increase the risk of anxiety for pregnant women and mothers[28]. In the study, we found that anxiety scores and anxiety rates were similar in early and late postpartum in COVID-19 positives. This is likely due to lack of information and reassurance through social media, health professionals, and primary care services.

The American College of Obstetrics and Gynecology (ACOG) recommends that women be screened for depression and anxiety at least once in the perinatal period[29]. The prevalence of anxiety and depression among postpartum women during the COVID-19 pandemic has been documented to be as high as 35.8%[30] and 14.8%[31], respectively. Rates of postpartum depression (PPD) were reported as 14.7%[32], 17.4%[33], and 34%[34] during the pandemic in Turkey. The rates of postpartum depression and anxiety in our study population were 28.7% (29 of 101 cases) and 39.6% (40 of 101 cases), respectively. These differences in the prevalence of PPD could be attributed to ethnicity, differences in the scales used, sample size, timing of the study in the pandemic, and the postpartum weeks in which they were administered.

Previous research has identified a number of biological, psychological, socioeconomic, and cultural factors that were associated with the development of PPD[35]. In our study, education level

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and employment status significantly affected the BDI score of COVID-19-positive women, whereas other variables had no significant effect. In the study of Araiana et al., maternal depression was significantly associated with COVID-19 infection and number of pregnancies[23]. Suárez-Rico et al. found a positive correlation between maternal depression and COVID-19 positivity and a negative correlation with maternal age[20]. In our study, spousal support, marital relationship, and childbirth-related illness significantly affected BAI score in COVID-19 positive women, whereas other variables had no significant effect. Similarly, Suárez-Rico et al. found a negative correlation between maternal age and anxiety[20]. Ayaz et al. showed that relationship with husband and body mass index were associated with depressive and anxiety status[36]. However, in a univariate analysis, Bachani et al. found that sociodemographic and obstetric variables were not significantly associated with moderate anxiety or depressive disorder[37].

The major limitation of the present study is the relatively small sample size for each group. This should be kept into account when interpreting the results. The study data were collected from a single tertiary hospital. Therefore, the results cannot be generalized. Self-report bias may exist, as the participants completed the questionnaires themselves. We did not assess the effects of separation of mother and infant, as separation of the infant from the mother with COVID-19 was discontinued at the beginning of the study[38]. The strength of our study is the assessment of maternal mental health in the late postpartum period (6 -18 months).

Conclusion

It has been previously reported that mental health disorders in pregnancy and the postpartum period during the pandemic are more common than expected and cause serious adverse effects on women and their children. We found in our study that COVID-19 infection during pregnancy had no significant additional impact on long-term postpartum depression and anxiety status.

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