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COVID-19 Pandemic and the Incidence of Postpartum Depression: a Retrospective Cohort Study

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Abstract

Introduction: To estimate the association between COVID-19 and postpartum depression (PPD) in a retrospective cohort study.
Material and methods: Pregnant women who delivered between September 2019-June 2021 at a Mouth Sinai Health System practice in New York City were identified. Baseline information about maternal health, pregnancy outcomes, and postpartum visits were obtained from electronic health records. Edinburgh Postnatal Depression Scores (EPDS) were used as a postpartum depressive symptom marker. Three analyses were performed to compare scores between: (1) women who delivered before and after COVID-19, (2) pregnant women who delivered after the pandemic who did and did not contract COVID-19, and 3) pregnant women eligible for the COVID-19 vaccine who were and were not vaccinated.
Results: A total of 1.797 pregnant women were identified. Pregnant women during the pandemic had statistically significant higher rates of pre-existing mental health diagnoses and psychiatric medicine use compared to those who were pregnant before. No difference was observed in EPDS scores of pregnant women who delivered before vs. after the start of COVID-19 nor between COVID-vaccinated and unvaccinated pregnant women. Women who contracted COVID-19 in pregnancy had lower EPDS scores than women who did not. Results remain unchanged after controlling for baseline mental health diagnoses.
Conclusions: In our cohort, EPDS scores were not associated with pregnancy during the pandemic, COVID infection while pregnant, or COVID vaccination during pregnancy. However, we did identify a higher incidence of baseline mental health diagnoses during the COVID pandemic, but that did not lead to a higher rate of positive screens for postpartum depression.

Keywords: COVID-19, Postpartum depression, Maternal mental health

Streszczenie

Wstęp: Celem pracy było określenie związku między COVID-19 a depresją poporodową (PPD).
Materiał i metody: Do retrospektywnego badania wykorzystano dane pochodzące z Mouth Sinai Health System practice w Nowym Jorku. Przeanalizowano dokumentację medyczną kobiet, które urodziły między wrześniem 2019 a czerwcem 2021. Podstawowe dane socjodemograficzne, stan zdrowia podczas ciąży i dane poporodowe uzyskano retrospektywnie z elektronicznej dokumentacji medycznej. Do oceny objawów depresji wykorzystano Edynburską Skalę Depresji Poporodowej (EPDS). Ocenę nasilenia objawów depresji porównano między: (1) kobietami, które rodziły przed i po rozpoczęciu COVID-19 (13 marca 2020 r.), (2) kobietami w ciąży, które rodziły po 13 marca 2020 r., które rodziły i nie rodziły COVID-19 w czasie ciąży oraz 3) kobiet w ciąży kwalifikujących się do szczepienia przeciwko COVID-19, które były i nie były szczepione przeciwko COVID-19 przed ciążą lub w jej trakcie.
Dyskusja: Zebrano dane od 1797 kobiet w ciąży. Kobiety, które były w ciąży podczas COVID-19, przed okresem ciąży istotnie częściej cierpiały na zaburzenia psychiczne i stosowały leki psychiatryczne w porównaniu z kobietami, które były w ciąży przed pandemią. Nie zaobserwowano różnic w wynikach EPDS kobiet w ciąży, które urodziły przed i po rozpoczęciu COVID-19

oraz między kobietami w ciąży zaszczepionymi i nieszczepionymi. Wyniki te pozostają niezmienione po uwzględnieniu podstawowych diagnoz psychiatrycznych.

Wnioski: W badanej kohorcie nasielnie objawów depresji nie było związane z ciążą podczas pandemii, zakażeniem COVID-19 podczas ciąży ani szczepieniem przeciwko COVID-19 podczas ciąży. Zidentyfikowaliśmy jednak wyższą częstość występowania wyjściowych diagnoz psychiatrycznych podczas COVID-19, ale nie wpłynęło to na wyższy odsetek występowania objawów zaburzeń depresyjnych.

Słowa kluczowe: depresja poporodowa, COVID-19, zdrowie psychiczne matki

Introduction

The increased susceptibility of women to psychiatric illnesses such as depression during the postnatal period has been well established, and risk of postpartum depression has been linked to factors including physical, psychosocial, obstetric, and environmental conditions.

On January 30, 2020, the World Health Organization (WHO) declared the coronavirus disease 2019 (COVID-19) outbreak a public health emergency, and on March 11, 2020, it was officially recognized as a global pandemic. On March 13, 2020, President Trump declared a nationwide emergency and Mayor de Blasio issued a state of emergency in New York City [1,2]. The emergence of the COVID-19 pandemic caused psychosocial disruption and significant stress worldwide. The COVID-19 Mental Disorders Collaborators found that COVID-19 increased cases of major depressive and anxiety disorders throughout 2020 by 27.6% and 25.6%, respectively [3]. Additionally, a 3-fold higher prevalence of depressive symptoms was observed during the pandemic compared with before, with an even higher incidence in individuals exposed concurrently to non-COVID-related stressors and those considered immunocompromised [4].

Pregnant women represent a uniquely vulnerable population susceptible to this COVID-related depression. Prior to COVID-19, it was found that 12% of healthy mothers without prior depression history develop postpartum depression (PPD) and anxiety/depressive symptoms are typically observed in 10-25% of pregnant individuals [5,6]. We hypothesized that the added stress of the global pandemic would exacerbate these depressive symptoms and increase the prevalence of postpartum depression among women who pregnant during the pandemic compared to those who delivered before it began.

While postpartum depression is associated with worse maternal physical and psychological health and diminished quality of life, it has also been shown to negatively impact infant behavior, cognitive growth, language development, sleep quality, and overall physical health [7]. Due to the significant long-term effects of PPD on both mother and child, understanding whether pregnancy during COVID-19 increases the risk of PPD may enable early identification of these patients, intervention to reduce the severity of their symptoms, and prevention of negative long-term outcomes. The objective of this study is to estimate associations between COVID and PPD according to time of delivery (pre- or post-COVID), COVID infection during pregnancy, and COVID vaccination status.

Materials and Methods

This was a retrospective cohort study of all women with pregnancies who presented for prenatal care and delivered within a single, large, maternal-fetal medicine and obstetrical practice in New York City (NYC) from September 2019 to June 2021. We identified all live deliveries and reviewed maternal electronic medical records for baseline characteristics and scores on postpartum depression screening. Pregnancies with intrauterine fetal demise (IUFD) were excluded. Institutional review board approval for this study was obtained.

The primary outcome was a positive postpartum depression screen, defined by a score ≥10 on the Edinburgh Postnatal Depression Scale (EPDS). The EPDS is a self-reported 10-item questionnaire that has been validated as a screen for maternal depressive symptoms in the postnatal period [8] and employed for research purposes. Over the course of the study period, the EPDS was routinely administered to patients at their 6-week postpartum visit. When virtual postpartum visits were conducted and the EPDS could not be officially conducted, provider notes documenting substantial depression, stress, and anxiety suggestive of PPD were classified as clinically significant as well.

Based on our data, we decided to run 3 separate analyses to determine the association between the COVID-19 pandemic and mental health during pregnancy. We selected March 13, 2020, the date when a state of emergency was declared in NYC, as the definitive start of the COVID-19 pandemic outbreak. (1) We compared EPDS scores between patients who delivered during vs prior the outbreak of the pandemic. (2) Among patients who delivered after March 13, 2020, we compared EPDS scores between those who did and did not have confirmed COVID-19 infection during pregnancy. (3) Among patients

who were pregnant and eligible for COVID-19 vaccination beginning on February 14, 2021, we compared outcomes between those who did and did not receive at least 1 dose of the vaccine.

We compared baseline characteristics and outcomes using chi-square and student's t-tests for parametric data and Fisher's exact test for nonparametric data, respectively. Regression analysis was performed to control for any significant differences in baseline (P<0.05).

Results

Pre-COVID pregnancy vs. post-COVID pregnancy

A total of 1.797 women who gave birth between September 1, 2019, and June 30, 2021 met the study inclusion criteria. To address the first research question, women were divided into 2 groups based on the time of delivery: pre-COVID (prior to March 13, 2020) and post-COVID (after March 13, 2020). Their demographic data is summarized in **Table 1**. The differences in nulliparity, mental health diagnosis type, gestational age at delivery, preterm birth, gestation number, delivery mode, and singleton neonatal weight were not significant between the 2 groups. However, women who were pregnant post-COVID tended to be younger (32.6 vs. 33.5 years, P=0.006) and had a higher incidence of any mental health diagnosis (12.2% vs. 4.8%, P<0.001) and psychiatric medication during pregnancy or postpartum (6.6% vs. 3.9%, P=0.021) compared to the pre-COVID group.

Table 1. Baseline Cohort Characteristics in Patients Who Delivered Pre- & Post-COVID-19 (March 13, 2020).

Maternal Characteristic		Total (n=1797)	Pre-COVID (n=545)	Post-COVID (n=1252)	p-value
Maternal age (y) (mean ± SD)		32.9 (±6.0)	33.5 (±6.0)	32.6 (±6.1)	**0.006**
Nulliparous		749 (41.7%)	223 (40.9%)	526 (42.0%)	0.133
Any pre-existing mental health diagnosis		179 (10.0%)	26 (4.8%)	153 (12.2%)	**<0.001**
	Depression	61 (3.4%)	11 (2.0%)	50 (4.0%)	
	Anxiety	136 (7.6%)	17 (3.1%)	119 (9.5%)	
	OCD	3 (0.2%)	0 (0%)	3 (0.2%)	
	ADHD 5	5 (0.3%)	1 (0.2%)	4 (0.3%)	
	Bipolar disorder	6 (0.3%)	2 (0.4%)	4 (0.3%)	
	Prior PPD	6 (0.3%)	2 (0.4%)	4 (0.3%)	
	Other	5 (0.3%)	0 (0%)	5 (0.4%)	
Psychiatric medication in pregnancy or postpartum		104 (5.8%)	21 (3.9%)	83 (6.6%)	**0.021**
Gestational age at delivery (wk) (mean ± SD)		38.60 (±2.24)	38.64 (±2.27)	38.58 (±2.22)	0.557
Preterm birth (<37 wk)		237 (13.2%)	66 (12.1%)	171 (13.7%)	0.373
Multiple gestation		94 (5.2%)	24 (4.4%)	70 (5.6%)	0.299
Delivery mode					
Vaginal		1136 (63.2%)	336 (61.7%)	800 (63.9%)	0.364
Cesarean		661 (36.8%)	209 (38.3%)	452 (36.1%)	
Singleton birthweight (mean ± SD)		3200.45 (±545.4)	3200.97 (±558.0)	3200.23 (±539.7)	0.980

**Mental health diagnosis subcategories do not sum up because some patients had multiple diagnoses*

Table 2 shows the EPDS scores based on pregnancy pre- or post-COVID. Women who were pregnant during COVID-19 did not have statistically significant higher EPDS scores or incidence of positive screens compared to women who were pregnant before COVID-19. The results were consistent when excluding women with pre-existing mental health diagnoses, and no difference was observed in EPDS scores or positive screens between groups.

COVID infection during pregnancy vs. no COVID infection during pregnancy

The second research question compared women according to whether or not they contracted the COVID-19 virus during pregnancy; their data is summarized in **Table 3**. Of the 1.199 women who gave birth on March 13, 2020 and later, 166 of them contracted COVID-19 during their pregnancy while 1.033 who did not. Significant differences were observed for maternal age, parity, preexisting mental health diagnosis, previous or pregnancy-related psychiatric medications, and multiple gestations. Women who contracted COVID-19 during their pregnancy tended to be younger (31.3 vs. 32.9, P<0.001), multiparous (24.1% vs. 44.8% nulliparity, P<0.001), not diagnosed with a preexisting mental health condition

Table 2. Postpartum Depression Outcomes Based on Pregnancy Pre- or Post-COVID-19 (March 13, 2020).

Depression Variable	Pre-COVID	Post-COVID	Unadjusted p-value	Adjusted OR (95% CI)*
Full Cohort	N=545	N=1252		
6-week postpartum depression screen completed	508 (93.2%)	1197 (95.6%)	0.032	1.617 (1.039, 2.517)
EPDS score (mean ± SD)	3.3 (±3.4)	3.1 (±3.4)	0.346	0.351 (-0.01, 0.80)
Positive postpartum depression screen	30 (5.5%)	64 (5.1%)	0.649	0.902 (0.577, 1.409)
Excluding Patients with a Pre-existing Mental Health Diagnosis	N=519	N=1099	N/A	N/A
6-week postpartum depression screen completed	483 (93.1%)	1051 (95.6%)	0.025	1.681 (1.061, 2.664)
EPDS score (mean ± SD)	3.2 (±3.4)	2.8 (±3.1)	0.056	0.351 (-0.009, 0.710)
Positive postpartum depression screen	26 (5.0%)	41 (3.7%)	0.190	0.715 (0.432, 0.183)

**Adjusted for maternal age and pre-existing mental health diagnosis*
**Mental health diagnosis subcategories do not sum up because some patients had multiple diagnoses*

Table 3. Baseline Characteristics of Patients with and without COVID-19 During Pregnancy, (Deliveries March 13, 2020 and later - Change to deliveries beginning after and including March 13, 2020 until June 30, 2021).

Maternal Characteristic		Total (n=1199)	COVID-19 in pregnancy (n=166)	No COVID-19 in pregnancy (n=1033)	p-value
Maternal age (y) (mean ± SD)		32.7 (±6.0)	31.3 (±6.2)	32.9 (±6.0)	**<0.001**
Nulliparous		503 (42.0%)	40 (24.1%)	463 (44.8%)	**<0.001**
Any pre-existing mental health diagnosis		148 (12.3%)	12 (7.2%)	136 (13.2%)	**0.030**
	Depression	50 (4.2%)	1 (0.6%)	49 (4.7%)	
	Anxiety	115 (9.6%)	11 (6.6%)	104 (10.1%)	
	OCD	3 (0.3%)	1 (0.6%)	2 (0.20%)	
	ADHD 5	4 (0.3%)	0 (0%)	4 (0.4%)	
	Bipolar disorder	4 (0.3%)	0 (0%)	4 (0.4%)	
	Prior PPD	4 (0.3%)	1 (0.6%)	3 (0.3%)	
	Other	5 (0.4%)	0 (0%)	5 (0.5%)	
Psychiatric medication in pregnancy or postpartum		82 (6.8%)	5 (3.0%)	77 (7.5%)	**0.032**
Gestational age at delivery (wk) (mean ± SD)		38.6 (±2.2)	38.8 (±1.8)	38.5 (±2.3)	0.071
Gestational age at COVID-19 (mean ± SD)		N/A	22.8 (±10.3)	N/A	N/A
Hospitalized for COVID-19 infection		N/A	4 (2.4%)	N/A	N/A
Preterm birth (<37 wk)		167 (13.9%)	21 (12.7%)	146 (14.1%)	0.717
Multiple gestation		69 (5.8%)	4 (2.4%)	65 (6.3%)	**0.047**
Delivery mode					
Vaginal		762 (63.6%)	112 (67.5%)	650 (62.9%)	0.297
Cesarean		437 (36.4%)	54 (32.5%)	383 (37.1%)	
Singleton birthweight (mean ± SD)		3204 (±536)	3209 (±476)	3203 (±546)	0.446

**Mental health diagnosis subcategories do not sum up because some patients had multiple diagnoses*

(7.2% vs. 13.2% mental health diagnosis, P=0.03), and not taking psychiatric medications (3.0% vs. 7.5%, P=0.032), compared to pregnant women who did not contract COVID. Additionally, a larger portion of the pregnant women who did not contract COVID were carrying multiples) vs. pregnant women who did contract COVID (6.3% vs. 2.4%, P=0.047). When comparing postpartum depression outcomes between these 2 groups, women who had COVID during pregnancy had lower EPDS scores overall, and fewer had positive postpartum depression screens compared to women who did not contract COVID-19 (**Table 4**). When excluding patients with a previous mental health diagnosis, the mean EPDS score difference remained statistically significantly lower in the COVID pregnant cohort while the difference in positive PPD screens no longer was significant.

Table 4. Postpartum Depression Outcomes Based on COVID-19 During Pregnancy (Deliveries March 13, 2020 and later - Change to deliveries beginning after and including March 13, 2020 until June 30, 2021).

Depression Variable	COVID-19 in pregnancy	No COVID-19 in pregnancy	Unadjusted p-value	Adjusted OR (95% CI)*
Full Cohort	N=166	N=1033		
6-week postpartum depression screen completed	1161 (97.0%)	990 (95.8%)	0.503	1.63 (0.574, 4.607)
EPDS score (mean ± SD)	2.4 (±2.5)	3.2 (±3.5)	**0.002**	0.829 (0.264, 1.395)
Positive postpartum depression screen	3 (1.8%)	58 (5.6%)	**0.036**	0.304 (0.094, 0.948)
Excluding Patients with a Pre-existing Mental Health Diagnosis	N=154	N=897	N/A	N/A
6-week postpartum depression screen completed	149 (96.8%)	861 (96.0%)	0.640	1.428(0.499, 4.089)
EPDS score (mean ± SD)	2.4 (±2.5)	2.9 (±3.2)	0.023	0.537 (0.076, 0.997)
Positive postpartum depression screen	2 (1.3%)	37 (4.1%)	0.105	0.302 (0.72, 1.268)

**Adjusted for maternal age and parity*
**Mental health diagnosis subcategories do not sum up because some patients had multiple diagnoses*

COVID vaccination during pregnancy vs. no COVID vaccination during pregnancy

Lastly, women were grouped by COVID vaccination status into vaccinated and non-vaccinated pregnant cohorts. On February 14, 2021, New Yorkers with underlying comorbidities (such as pregnancy) became eligible to receive the COVID-19 vaccine [9]. Of the 379 women in the original study cohort who were pregnant and eligible for COVID vaccination (delivery post-February 14, 2021), 80 women received at least 1 dose of their vaccination series prior to delivery; 299 women opted against COVID vaccination. The demographic data is illustrated in **Table 5**. 6. 3% of vaccinated pregnant women contracted COVID-19 during pregnancy compared to 13.4% in the unvaccinated group (p=0.08). Eligible and vaccinated pregnant women were more likely to be nulliparous (50.0% vs. 37.1%, P=0.030), have received a previous mental health diagnosis (23.8% vs. 10.0%, P=0.001), be taking psychiatric mediations during pregnancy or postpartum (15.0% vs. 4.3%, P<0.001), and currently have a multiple gestation pregnancy (8.8% vs. 3.3%, P=0.038) vs. their eligible but unvaccinated counterparts. However, no statistically significant differences were observed for postpartum depression outcomes either before or after excluding patients with preexisting mental health conditions or after adjusting for maternal age and parity (see **Table 6**).

Discussion

Principle Findings

Across all three of our analyses (pre-COVID vs. post-COVID pregnancy, COVID infection vs. no COVID infection during pregnancy, and COVID vaccination vs. no COVID vaccination during pregnancy), our findings consistently showed no association between COVID-19 and increased EPDS scores or positive screen rates. Specifically, we observed no correlation between COVID-19 and EPDS scores during the COVID-19 pandemic despite increased mental health diagnoses and psychiatric medications within the pregnant population at this time.

Table 5. Baseline Cohort Characteristics in Patients Who Were Vaccinated or Unvaccinated After Eligibility (Deliveries March 13, 2020 and later - Change to deliveries beginning after and including March 13, 2020 until June 30, 2021).

Maternal Characteristic		Total (n=379)	Vaccinated (n=80)	Not Vaccinated (n=299)	p-value
Maternal age (y) (mean ± SD)		32.82 (±5.96)	34.06 (±4.88)	32.51 (±6.18)	0.038
Nulliparous		151 (3.7%)	40 (50.0%)	111 (37.1%)	**0.030**
Any pre-existing mental health diagnosis		49 (12.9%)	19 (23.8%)	30 (10.0%)	**0.001**
	Depression	15 (4.0%)	7 (8.8%)	8 (2.7%)	
	Anxiety	36 (9.5%)	14 (17.5%)	22 (7.4%)	
	OCD	0 (0.0%)	0 (0.0%)	0 (0.0%)	
	ADHD 5	2 (0.5%)	1 (1.3%)	1 (0.33%)	
	Bipolar disorder	2 (0.5%)	0 (0.0%)	2 (0.67%)	
	Prior PPD	0 (0.0%)	0 (0.0%)	0 (0.0%)	
	Other	4 (1.1%)	2 (2.5%)	2 (0.67%)	
Psychiatric medication in pregnancy or postpartum		25 (6.6%)	12 (15.0%)	13 (4.3%)	**<0.001**
Gestational age at delivery (wk) (mean ± SD)		38.62 (±1.85)	38.62 (±1.86)	38.63 (±1.85)	0.973
Preterm birth (<37 wk)		60 (5.8%)	13 (16.3%)	47 (5.7%)	0.084
Multiple gestation		17 (4.5%)	7 (8.8%)	10 (3.3%)	**0.038**
Delivery mode					
Vaginal		238 (62.6%)	43 (53.8%)	195 (65.2%)	0.069
Cesarean		141 (37.2%)	37 (46.3%)	104 (34.8%)	
Singleton birthweight (mean ± SD)		3215.07 (±481.67)	3225.36 (±496.23)	3210.65 (±478.59)	0.820
COVID in pregnancy		45 (11.8%)	5 (6.3%)	40 (13.4%)	0.080

**Mental health diagnosis subcategories do not sum up because some patients had multiple diagnoses*

Table 6. Postpartum Depression Outcomes Based on COVID-19 Vaccination During Pregnancy.

Depression Variable	Vaccinated	Not Vaccinated	Unadjusted p-value	Adjusted OR (95% CI)*
Full Cohort	N=80	N=299		
6-week postpartum depression screen completed	79 (98.8%)	286 (95.7%)	0.226	3.32 (.425, 25.88)
EPDS score (mean ± SD)	3.3 (±3.3)	3.1 (±3.4)	0.696	0.167 (-1.009, 0.676)
Positive postpartum depression screen	4 (5.0%)	16 (5.4%)	0.854	0.900 (0.292, 2.773)
Excluding Patients with a Pre-existing Mental Health Diagnosis	N=61	N=269	N/A	N/A
6-week postpartum depression screen completed	61 (100.0%)	257 (95.5%)	0.108	1.237 (1.173, 1.305)
EPDS score (mean ± SD)	2.8 (±2.88)	3.0 (3.3)	0.670	0.181 (0.661, 1.023)
Positive postpartum depression screen	2 (3.3%)	15 (5.6%)	0.425	0.547 (0.122, 2.457)

**Adjusted for maternal age & parity*

Results in Context of What is Known

To our knowledge, this is the first retrospective sub-sectioned cohort study to look at PPD data and correlations among pregnant women during COVID-19 in the United States. Of note, there are several systemic literature reviews and meta-analyses focused on prevalence and risk factors, one case series in NYC (at the same maternal-fetal medicine and obstetrical practice as the one where this study was conducted), and one survey-based study and cross-sectional study (both based in China) [10-14]. These studies, however, grouped all the pregnant patients together and none of them studied the effect of COVID infection during pregnancy or the role of vaccination on PPD.

Clinical Implications

Our study found that in there was a higher likelihood of mental health diagnosis and medication use in patients who were pregnant during the COVID-19 pandemic compared with before, with no difference in EPDS score. This finding highlights the pronounced psychological havoc wreaked by the COVID-19 pandemic on mental health worldwide, and specifically adds to the mounting scientific literature on the high burden experienced by vulnerable populations, including pregnant women [15]. At the same time, this result highlights both the success of health practitioners in addressing this problem and the efficacy of proper mental health management and treatment, specifically as it pertains to PPD. While more pregnant women had mental health diagnoses and took medication during COVID, they did not experience increased rates of positive PPD screening or symptoms, as evident by their EPDS scores, which were comparable to their non-diagnosed and non-medicated counterparts.

Knowing this, screenings for maternal mental health conditions should be routine not only postpartum, but antepartum and pre-conception as well. Prioritizing proactive obstetric care and treating depression and anxiety will not only reduce the likelihood of developing postpartum depression but also benefit the well-being of the mother and baby.

Research Implications

One hypothesis to explain these findings may be that the effects of COVID had already present at baseline, so whatever effect COVID had on pregnant women and PPD was already there. Another explanation may be that pregnant women were better prepared for a psychological stressor when the pandemic began compared to their non-pregnant counterparts. Pregnancy itself acts a stressor, and many women experience increased rates of anxiety and depression with or without a concurrent infectious disease pandemic. Although some studies did find even higher incidences of anxiety and stress specifically due to COVID [16], it is possible that the pregnant women were better prepared for the additional psychological impact and therefore did not experience higher levels of PPD. Future studies should explore this hypothesis further.

Strengths and Limitations

The biggest limitation of our study is that the main outcome (PPD) was measured based on EPDS, which has been validated as a screening tool [17] but is not diagnostic. Additionally, we did not have complete data on how many women who screened positive on EPDS were diagnosed and treated for PPD. Additional limitations of this study pertain to its retrospective design. Because we depended on electronic medical records documented before the conception of the study, we were unable to investigate other confounding variables that may have impacted our results, such as social support, marital status, socioeconomic status, employment, and education, to name a few. Also, we did not study neonatal, perinatal, or postpartum maternal outcome data, which also could have impacted our results. For example, NICU admission has been shown to be a significant predictor of both PDD diagnosis and symptomology [18]. Similarly, delivery complications such as preeclampsia, prolonged hospitalization, and emergency caesarean delivery are strongly associated with PPD [19].

Despite these limitations, our study's notable strengths include its large cohort, served by one team of doctors with uniform EPDS screening, and three varied perspectives we used to investigate the association between COVID and PPD. We also controlled for confounders both with a regression analysis and with a subgroup analysis excluding women with pre-existing mental health diagnoses

Conclusions

In our cohort, EPDS scores were not associated with pregnancy during the COVID pandemic, COVID infection during pregnancy, or COVID vaccination during pregnancy. We did find that there was a higher incidence of baseline mental health diagnoses during the COVID pandemic, but that did not lead to a higher rate of positive screens for postpartum depression.

Conflict of interest

The author has declared no conflict of interest.

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