Depression, Anxiety, and Mother-Infant Bonding in Women Seeking Treatment for Postpartum Depression Before and During the COVID-19 Pandemic

Haley Layton, MPH[a,*]; Sawayra Owais, MSc[b]; Calan D. Savoy, MSc[c]; and Ryan J. Van Lieshout, MD, PhD[c]

ABSTRACT

Objective: The conditions created by the COVID-19 pandemic could negatively affect maternal mental health and the mother-infant relationship. The aim of this study is to determine the impact of the COVID-19 pandemic on depression, anxiety, and mother-infant bonding among women seeking treatment for postpartum depression (PPD).

Methods: Baseline data collected in two separate randomized controlled trials of a psychoeducational intervention for PPD in the same geographic region, one prior to COVID-19 (March 2019–March 2020) and one during the COVID-19 pandemic (April–October 2020), were compared. Eligible participants had an Edinburgh Postnatal Depression Scale (EPDS) score of ≥ 10, were ≥ 18 years of age, had an infant < 12 months old, and were fluent in English. Outcomes included PPD (EPDS), anxiety (Generalized Anxiety Disorder-7 [GAD-7]), and mother-infant relationship (Postpartum Bonding Questionnaire [PBQ]). All were measured continuously and dichotomized at accepted clinical cutoffs.

Results: Of the 603 participants (305 pre–COVID-19; 298 during COVID-19), mothers enrolled during the COVID-19 pandemic reported higher levels of symptoms of PPD (B = 1.35; 95% CI, 0.64 to 2.06; Cohen *d* = 0.31) and anxiety (B = 1.52; 95% CI, 0.72 to 2.32; Cohen *d* = 0.30). During COVID-19, women had 65% higher odds of clinically significant levels of depression symptoms (OR = 1.65; 95% CI, 1.13 to 2.31) and 46% higher odds of clinically relevant anxiety symptoms (OR = 1.46; 95% CI, 1.05 to 2.05). However, there were no statistically significant differences in mother-infant bonding.

Conclusions: The findings of this study suggest that rates and severity of PPD and anxiety symptoms among women seeking treatment for PPD have worsened in Canada during the COVID-19 pandemic. However, treatment-seeking mothers have consistently maintained good relationships with their infants. Considering the difficulties women with PPD face when accessing treatment, it is important that strategies are developed and disseminated to safely identify and manage PPD to mitigate potential long-term adverse consequences for mothers and their families.

Trial Registration: ClinicalTrials.gov identifiers: NCT03654261 and NCT04485000

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[a]Health Research Methodology Graduate Program, McMaster University, Hamilton, Ontario, Canada

[b]MD/PhD Program, McMaster University, Hamilton, Ontario, Canada

[c]Department of Psychiatry and Behavioural Neurosciences, McMaster University, Hamilton, Ontario, Canada

**Corresponding author:* Haley Layton, MPH, McMaster University, 1200 Main St West, Hamilton, ON, Canada, L8N 3Z5 (laytonh@mcmaster.ca).

Postpartum depression (PPD) is a major public health problem that affects up to 1 in 5 mothers.[1,2] When women with subsyndromal levels of symptoms are counted, as many as 1 in 3 women are affected.[3] The COVID-19 pandemic has further exposed vulnerabilities in social and economic systems that lead to inequalities for mothers with mental health problems and their children, worsening systemic biases that exist within the health care system. Women seeking treatment for mental health concerns in the perinatal period in particular are experiencing substantial worry, isolation, and insomnia.[4,5]

During the COVID-19 pandemic, mothers have had more responsibilities than ever before, providing care to their infants and toddlers and in some cases educating their older children while managing households and supporting partners.[6] They are profoundly worried about job losses, reduced income, and food insecurity, all of which have disrupted family routines and increased partner conflict and rates of intimate partner violence.[7]

The cumulative effect of these stressors combined with the challenge of navigating changes to postnatal care and closure or redeployment of key services[8–10] could worsen levels of depression and anxiety, with negative effects on the mother-infant relationship. Such changes could not only portend significant adverse consequences for mothers, but also negatively affect their infants, partners, and other children in the short and long term.

Mothers with mental health concerns during the COVID-19 pandemic are a highly vulnerable group,[11–14] and women seeking treatment for these problems after delivery may be at the greatest risk. However, very little work has explored the impact of the pandemic on this group. Most research examining the impact of COVID-19 on maternal mental health has focused on general population samples of pregnant or postpartum women,[15–22] some of which have even excluded women with previous or existing mental health problems.[20,22] While some of these studies have suggested that the pandemic has led to increases in levels of symptoms of depression and anxiety, most have not examined rates of clinically significant mental disorders and have been small or lacking adequate control groups. However, Wu and colleagues[15] did report increased rates of clinically significant depression and anxiety using the Edinburgh

Clinical Points

- The COVID-19 pandemic has had a negative impact on maternal mental health; however, its impact on treatment-seeking women has yet to be determined.
- Women seeking treatment for postpartum depression during the COVID-19 pandemic have more symptoms of depression and anxiety and are 46%–65% more likely to present with clinically significant levels of symptoms of anxiety and depression than those seeking treatment prior to the pandemic.
- No changes in mother-infant bonding were seen in these women during the COVID-19 pandemic.

Postnatal Depression Scale (EPDS) in a general population sample of pregnant women, and Zanardo et al[5] found higher rates of depression but not anxiety using the same measure in a similar sample of Italian women in the first postpartum week.

Despite the well-known long-term effects of maternal mental health problems on infant development and behavior,[23–25] only one study[26] has examined the effect of the pandemic on the mother-infant relationship. While this work reported mother-infant bonding scores similar to those reported in studies prior to COVID-19, this effect was measured just 2 days postpartum.

Given the lack of knowledge of how the COVID-19 pandemic has impacted depression, anxiety, and mother-infant bonding among women seeking treatment for PPD, we compared levels of symptoms and clinically significant levels of these outcomes in community samples of women from the same geographic region enrolling in separate randomized controlled trials of 1-day Cognitive-Behavioral Therapy (CBT)–Based Workshops for PPD before and after the onset of the COVID-19 pandemic. Accurate estimates of the severity of depression and anxiety symptoms and mother-infant bonding problems among women experiencing symptoms of PPD can provide a more complete understanding of the scope and magnitude of the problems facing mothers during the pandemic and guide resource allocation during a time when the appropriate earmarking of funds is crucial. These data can also help inform the development and dissemination of rapidly scalable strategies to identify and manage PPD in an effort to mitigate these consequences for families, the health care system, and society.

METHODS

Sample

Mothers from Ontario, Canada, who were fluent in English, were ≥ 18 years of age with an infant less than 12 months old, had elevated levels of PPD symptoms (EPDS scores ≥ 10),[27] and were interested in participating in a 1-day CBT-Based Workshop for PPD intervention were recruited into two separate randomized controlled trials (RCTs). One was completed prior to COVID-19 (ClinicalTrials.gov identifier: NCT03654261) and the other during the pandemic (ClinicalTrials.gov identifier: NCT04485000). Both trials utilized identical recruitment procedures and examined the same outcomes. The first tested the effectiveness of workshops delivered in person between January 1, 2018, and mid-March 2020 (ie, pre–COVID-19 in North America), and the second was identical, but the intervention was delivered online between April and October 2020. All participants self-referred, responding to advertisements posted on social media and circulated through public health units, health care providers, and community clinics in the province of Ontario.

Procedure

Participants who were recruited between March 1, 2019, and March 16, 2020, and who completed baseline (pretreatment) measures constituted our pre–COVID-19 group, while participants recruited from April 20, 2020, to September 2, 2020, and who completed baseline, pretreatment measures made up the COVID-19 group. March 17, 2020, was the date a state of emergency was declared and pandemic-related restrictions took effect in Ontario.

After providing consent, women were randomized to workshops or a waitlist group, and all self-reported current symptoms of depression and anxiety and self-reported on the mother-infant relationship. Questionnaires were completed online using the Research Electronic Data Capture (REDCap; Vanderbilt University) platform. Ethics approval was obtained from the Hamilton Integrated Research Ethics Board. All participants provided written informed consent prior to enrolling in the study.

Measures

Sociodemographic characteristics. Participants reported their age, self-identified ethnicity, annual before-tax household income, years of education completed, marital status, number of children, use of antidepressant medication, and infant age at study enrollment (ie, pretreatment).

Depression. Participants completed the EPDS, a 10-item, gold-standard measure of PPD assessing symptoms over the past 7 days. Each item is scored on a 4-point Likert scale (0–3) that asks participants to rate the frequency of predominantly affective and cognitive symptoms of depression. To optimize the clinical relevance of our findings, we examined continuous EPDS scores and the prevalence of clinically significant levels of symptoms (EPDS score ≥ 13).[27]

Anxiety. The Generalized Anxiety Disorder 7-item scale (GAD-7) was used to assess postpartum anxiety (PPA). This 7-item scale measuring the severity of generalized anxiety disorder has been validated for use in postpartum samples.[28] Items are scored on a 4-point scale from 0 to 3, with a higher score indicating an increased risk of GAD. We examined GAD-7 score as both a continuous and a dichotomous outcome, for which a cutoff of ≥ 11 defined clinically important levels of anxiety symptoms.[29]

Mother-infant relationship. *Mother-infant bonding* refers to the core relationship that develops between mother

Table 1. Characteristics of Pre–COVID-19 and COVID-19 Samples[a]

Characteristic	Pre–COVID-19 (n = 305)	COVID-19 (n = 298)	*P* Value
Maternal age, y	32.94 (5.17)	31.74 (4.78)	.03
Infant age, mo	6.04 (4.18)	5.32 (3.66)	.02
Ethnicity, n (%)			
White	176 (57.70)	224 (75.17)	<.001
South Asian	33 (10.82)	17 (5.70)	.05
East Asian	26 (8.52)	18 (6.04)	.29
Caribbean	18 (5.90)	5 (1.68)	.02
Mixed	11 (3.61)	12 (4.03)	.52
Middle Eastern	11 (3.61)	4 (1.34)	.12
Latino/Hispanic	11 (3.61)	3 (1.01)	.06
African	9 (2.95)	2 (0.67)	.06
Annual household income, CAD	94,300 (53,700)	98,300 (51,900)	.35
Years of education	16.94 (2.40)	16.76 (2.25)	.35
Marital status, n (%)			
Married or common law	275 (90.16)	269 (90.27)	.82
Single	22 (7.21)	20 (6.71)	.85
One child, n (%)	171 (56.07)	186 (62.42)	.16
Currently taking antidepressant medication, n (%)	55 (18.03)	68 (22.82)	.19
EPDS score	14.93 (4.44)	16.28 (4.39)	<.001
EPDS score ≥ 13, n (%)	217 (71.15)	240 (80.27)	.01
GAD-7 score	10.88 (4.93)	12.39 (5.05)	<.001
GAD-7 score ≥ 11, n (%)	177 (58.03)	199 (66.78)	.02
PBQ score			
Bonding	12.20 (7.44)	12.67 (7.95)	.46
Rejection and anger	6.26 (4.88)	6.56 (5.31)	.48
Infant-focused anxiety	4.94 (3.02)	5.28 (3.18)	.18

[a]Values are shown as mean (SD) unless otherwise noted. For ethnicity, 23 participants did not provide a response, and for marital status, 17 participants did not provide a response.
Abbreviations: CAD = Canadian Dollars, EPDS = Edinburgh Postnatal Depression Scale, GAD-7 = Generalized Anxiety Disorder 7-item scale, PBQ = Postpartum Bonding Questionnaire.

and child and begins early in infancy. Impairments in bonding are a predictor of child abuse and neglect and are a common complication of PPD.[30] Participants completed the Postpartum Bonding Questionnaire (PBQ), a 25-item measure assessing 4 aspects of maternal-infant relations: (1) bonding, (2) rejection and anger toward the infant, (3) infant-focused anxiety, and (4) incipient abuse.[31] Subscales 1–3 were examined in this study given the lack of sensitivity of subscale 4. Each item is scored on a scale from 0 to 5, with higher scores suggestive of more problems. Mother-infant bonding was measured as a continuous and a dichotomous outcome, using cutoff scores for each subscale indicating bonding disorders. Cutoff values of 12 for bonding, 17 for rejection and anger, and 10 for infant-focused anxiety have been proposed to define bonding disorders in each category.[31]

Statistical Analysis

The characteristics of participants in the pre–COVID-19 and COVID-19 groups were compared using χ^2 tests and independent-samples *t* tests for dichotomous and continuous variables, respectively.

For all continuous outcomes, bivariate linear regression analyses were used to compare levels of depressive and anxiety symptoms and scores on mother-infant bonding subscales between mothers in pre–COVID-19 and COVID-19 groups. Given the meaningfulness of EPDS and GAD-7 scores to clinicians, unstandardized beta (B) values were reported with 95% CIs. Effect sizes were also expressed separately using Cohen *d*.

Odds of clinically significant levels of depression and anxiety symptoms as well as mother-infant bonding problems were calculated using unadjusted logistic regression models comparing rates in pre–COVID-19 and COVID-19 groups. Multivariate linear and logistic regression analyses adjusted for demographic characteristics found to be statistically significantly different in pre–COVID-19 and COVID-19 groups.

Statistical analyses were conducted using IBM SPSS Statistics 23 (2018).

RESULTS

The complete sample consisted of 603 women, with 305 in the pre–COVID-19 group and 298 in the COVID-19 group. All participants had complete data for all outcomes. The characteristics of participants in both groups are summarized in Table 1. Compared with women in the pre–COVID-19 group, women in the COVID-19 group were 1.2 years younger, had infants less than 1 month younger, and were more likely to self-identify as White. No other statistically significant differences in demographics were noted between groups.

Women seeking treatment for PPD during the pandemic had higher levels of symptoms of depression and anxiety, but not higher levels of difficulties with mother-infant bonding. Mothers in the COVID-19 group reported statistically significantly higher scores on the EPDS (B = 1.35; 95% CI, 0.64 to 2.06; Cohen *d* = 0.31) and GAD-7 (B = 1.52; 95% CI, 0.72 to 2.32; Cohen *d* = 0.30), associations that remained

Table 2. Depression, Anxiety, and Bonding Problems Prior to and During the COVID-19 Pandemic

Measure	Unadjusted B (95% CI)	Adjusted B (95% CI)[a]
EPDS	1.35 (0.64 to 2.06)	1.29 (0.60 to 2.07)
GAD-7	1.52 (0.72 to 2.32)	1.32 (0.59 to 2.24)
PBQ		
Bonding	0.47 (−0.76 to 1.70)	0.78 (−0.59 to 1.97)
Rejection and anger	0.30 (−0.52 to 1.11)	0.39 (−0.46 to 1.23)
Infant-focused anxiety	0.34 (−0.16 to 0.84)	0.24 (−0.28 to 0.75)

[a]Adjusted models controlled for maternal age, infant age, and ethnicity (White as reference).
Abbreviations: EPDS = Edinburgh Postnatal Depression Scale, GAD-7 = Generalized Anxiety Disorder 7-item scale, PBQ = Postpartum Bonding Questionnaire.

Table 3. Clinically Significant Levels of Depression, Anxiety, and Mother-Infant Bonding Problems Prior to and During the COVID-19 Pandemic

Measure	Unadjusted OR (95% CI)	Adjusted OR (95% CI)[a]
EPDS	1.65 (1.13 to 2.41)	1.65 (1.12 to 2.45)
GAD-7	1.54 (1.08 to 2.17)	1.46 (1.02 to 2.10)
PBQ		
Bonding	1.04 (0.75 to 1.44)	1.15 (0.82 to 1.62)
Rejection and anger	1.35 (0.58 to 3.12)	1.53 (0.63 to 3.71)
Infant-focused anxiety	1.75 (0.96 to 3.17)	1.61 (0.87 to 2.98)

[a]Adjusted models controlled for maternal age, infant age, and ethnicity (White as reference).
Abbreviations: EPDS = Edinburgh Postnatal Depression Scale, GAD-7 = Generalized Anxiety Disorder 7-item scale, OR = odds ratio, PBQ = Postpartum Bonding Questionnaire.

statistically significant after adjustment for differences in the two groups in maternal age, infant age, and ethnicity (Table 2).

When clinically significant levels of depressive and anxiety symptoms were examined, mothers in the COVID-19 group had 65% higher odds of clinically relevant depression symptoms (EPDS score ≥ 13; OR = 1.65; 95% CI, 1.13 to 2.41) and 46% higher odds of clinically relevant anxiety symptoms (OR = 1.54; 95% CI, 1.08 to 2.17) than the pre–COVID-19 sample (Table 3). These associations remained statistically significant even after statistical adjustment for maternal age, infant age, and ethnicity. There was no increase in the risk of bonding disorders (ie, impaired bonding, rejection and anger, or infant-focused anxiety) during COVID-19.

DISCUSSION

Among mothers living in the community and seeking treatment for PPD symptoms in the first postpartum year, levels of symptoms of depression and anxiety as well as rates of clinically significant PPD and PPA symptoms increased during the COVID-19 pandemic. While the effect size of these findings was small, depression and anxiety scores did increase during the COVID-19 pandemic, and the odds of women presenting with clinically significant levels of symptoms of depression or anxiety during the pandemic were 65% and 46% higher, respectively. Despite higher symptom levels, levels of problems with mother-infant bonding did not increase during COVID-19. To our knowledge, these data are the first available on women seeking treatment for PPD, and this study is one of the very few that contain prospectively collected data on comparable samples prior to and during the pandemic. These findings highlight the importance not only of screening women at risk for PPD, but also of providing support and treatment to these mothers.

The magnitude of the increase in depression scores noted in our COVID-19 sample is similar to that found by Zanardo and colleagues[5] in their general population sample of women in the first postpartum week, but the effect size ($d = 0.31$) was smaller than that reported by Davenport and colleagues ($d = 0.66$).[19] Such increases may have been contributed to by concerns about the virus and the conditions created by measures put in place to restrict its spread.[4,32,33] The closure of schools, businesses, and recreational facilities accompanied by physical distancing measures have contributed to increased responsibility at home and reduced social support, while quarantine and isolation may also be leading to increased stress, uncertainty, fear, anxiety, and depression.[4]

However, the increase in the proportion of women scoring above EPDS cutoffs for clinically significant depression symptoms in our sample was lower than for other samples during the COVID-19 pandemic. In our sample of treatment-seeking women, 9% more women reported clinically significant depression symptoms during COVID-19, whereas Davenport and colleagues[19] reported that 25.7% more women in their COVID-19 sample had clinically significant depression compared to their pre–COVID-19 group. However, their sample included both pregnant and postpartum women, and pre–COVID-19 depression symptoms were self-reported during the pandemic through retrospective recall. Zanardo et al[5] also reported a greater increase (16.7%) in the proportion of women with clinically relevant PPD symptoms during COVID-19. However, their EPDS scores were measured 2 days postpartum and may have captured the "baby blues" as much as PPD. While both of these studies reported larger increases in PPD prevalence during COVID-19 than were observed our sample, this difference may be due to the fact that women in our study were recruited for having EPDS scores ≥ 10 and had mean scores that were substantially higher than did these other samples. While high baseline EPDS scores may have imposed a ceiling effect, estimates from prior studies may also have been higher because they captured maternal mental health very early on in the pandemic when confusion and fear may have been at their peak. The current study assessed outcomes over 6 months during the pandemic and may better represent the evolving conditions during COVID-19.

Anxiety scores were also higher during COVID-19, as were rates of clinically significant levels of symptoms of anxiety. Fears about infection, financial losses, and isolation and uncertainty about the future have contributed to increased anxiety in the general population.[34,35] However, these concerns combined with fears of infants becoming infected and uncertainties around accessing postnatal care may have contributed to observed increases in symptoms

of PPA.[36,37] Women in our COVID-19 group had slightly higher anxiety scores ($d = 0.30$; small effect), and 9% more presented with clinically significant levels of anxiety symptoms compared to the pre–COVID-19 group. However, this increase was less than in other studies. Davenport and colleagues reported a large effect ($d = 1.08$) when examining anxiety scores and an increase in the prevalence of clinically relevant anxiety among pregnant and postpartum women in their sample by 43% during COVID-19.[19] However, their work utilized a general population sample, and pre–COVID-19 anxiety symptoms were self-reported retrospectively, introducing the possibility of recall bias. Since our sample consisted of treatment-seeking women with elevated levels of depression symptoms suggestive of PPD,[27] and given high rates of comorbidity, it is not surprising that anxiety scores were also elevated in our sample, which could have limited progression to more severe levels of anxiety during COVID-19. Furthermore, previous studies captured perinatal anxiety only early on during the pandemic. Since anxiety levels have decreased over the course of lockdown,[18] previous studies may reflect only the initial spike related to the initial fears associated with COVID-19.

While mothers seeking treatment for PPD during COVID-19 reported more depression and anxiety, these symptoms and the stress of the pandemic did not appear to lead to a worsening of the mother-infant relationship. While elevated levels of PPD symptoms have been linked to problems with mother-infant bonding, the mothers in our sample scored either close to the clinical cutoff (bonding subscale) or substantially lower (all other subscales). These findings suggest that both prior to and during the COVID-19 pandemic, the treatment-seeking women in our sample did not exhibit problems of the mother-infant relationship that have been associated with PPD in previous studies.[38–41] Whether the lack of change in maternal-infant bonding scores in our sample is due to the participants' ability to mobilize additional personal strengths, the timing of measurement (5–6 months postpartum), or more mothers' having assistance from partners who are also at home[10] is not clear.

The results of this study should be interpreted in the context of its limitations. This study did utilize a sample of treatment-seeking women with EPDS scores ≥ 10, and so its results are not generalizable to all postpartum women. However, since as many as 1 in 3 women have these levels of symptoms,[3] the findings may be relevant to a substantial proportion of the population. Moreover, while effect sizes for continuous outcomes were small, odds of clinically significant disorders were elevated, and given the size of this group of women, the impact of COVID-19 may be substantial. That said, self-report questionnaires, but not structured psychiatric interviews or direct observation, were used to assess symptoms of PPD, PPA, and mother-infant bonding. However, all of these measures are commonly used and have been validated in clinical and non-clinical samples. Although participants learned of the original RCTs via multiple sources, a larger proportion of women said they learned of the online (COVID-19) intervention study via social media, which could contribute to the younger age of the COVID-19 group. Additionally, more women in the pre–COVID-19 sample were living in southern Ontario compared to the COVID-19 sample, which may contribute to the differences in ethnicity observed. We did adjust for these differences, and our results remained consistent. More women in the COVID-19 sample were taking antidepressant medication, which may be due to difficulty accessing alternate treatment options (ie, psychotherapy) during the pandemic; however, this difference was not statistically significant. As this study was not designed to account for specific pandemic-related stressors (eg, COVID-19 diagnosis, financial stress), we could not explore the mechanisms by which COVID-19 may have affected our outcomes. Women self-referred to the study after self-identifying as having elevated depressive symptoms, which may have introduced sampling bias. Finally, the sample lived in Canada, and most had a partner, had graduated high school, and had access to universal health care.

Despite these limitations, this study is, to the best of our knowledge, the first to examine levels of symptoms of PPD and PPA and the mother-infant relationship in comparably large samples of women seeking treatment for PPD in the same province before and during the COVID-19 pandemic. Studies with more diverse samples are needed to better understand the impact of the COVID-19 pandemic on postpartum maternal mental health, as well as offspring and family functioning in the short and long term. Understanding the mechanisms by which these changes occur and how we can optimize the heath and functioning of mothers and their families should continue to be an important focus.

CONCLUSIONS

The findings of this study indicate that the COVID-19 pandemic has had negative effects on maternal mental health but do not suggest worsening of the maternal-infant relationship. The long-term effects of the pandemic on maternal mental health and the development of their offspring are not yet known. Considering the difficulties women face when accessing mental health treatment, particularly during the pandemic, the problems that have emerged during COVID-19 could lead to more chronic difficulties, and so it is imperative that mothers have timely access to safe and effective treatments during the pandemic and beyond.

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Editor's Note: We encourage authors to submit papers for consideration as a part of our Focus on Women's Mental Health section. Please contact Marlene P. Freeman, MD, at mfreeman@psychiatrist.com.