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COVID-19 related worry moderates the association between postpartum depression and mother-infant bonding

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ABSTRACT

The aim of this study was to ask whether a substantial external stressor, such as the COVID-19 pandemic, affects the association between postpartum depression (PPD) and mother-infant bonding. Specifically, we aimed to determine whether worry regarding such an external threat differentially affected PPD and bonding by analyzing a longitudinal sample of postpartum women assessed before and during the pandemic. One-hundred forty women responded to online questionnaires at (T1) Pre-COVID-19: Six months postpartum (February 2018 to December 2019), and (T2) During COVID-19: Twenty-one months postpartum (April 2020 to January 2021). The strength of correlation between mother-infant bonding and PPD significantly declined from before (T1: $R = 0.64$, $p < 0.001$) to during the pandemic (T2: $R = 0.44$, $p < 0.001$; Difference = 0.20, $p = 0.05$). Furthermore, only PPD correlated with the worry due to the pandemic; thus the PPD-bonding association was weaker among women who were less concerned about the pandemic ($F(3, 136) = 15.4$, $R^2 = 0.25$). The study suggests that emotions and cognitions related to motherhood, such as mother-infant bonding, may be more resilient to external pressures such as a pandemic than affective states such as PPD. (174 words).

1. Introduction

Poor parental mental health is one of the main risk factors for disrupted parent-infant interactions that may adversely affect parents' bonding with their child (Moehler et al., 2006; Muzik et al., 2013; Parfitt and Ayers, 2009). The concept of maternal bonding refers to emotions and cognitions a mother has towards her infant and herself as a parent and is defined as 'an affective state of the mother' (Bicking Kinsey and Hupcey, 2013). While maternal bonding is closely linked to postpartum mood and anxiety disturbances (e.g., Moehler et al., 2006; Muzik et al., 2013), it has been suggested that parent-infant relationship difficulties are a distinct phenomenon with a different affective focus than depression (Brockington, 2004). Nevertheless, only a minority of studies have demonstrated different trajectories for postpartum depression (PPD) and maternal bonding (Kokubu et al., 2012; Ohara et al., 2018).

PPD is a highly prevalent postpartum disorder (Slomian et al., 2019) associated with stressful life events, such as health crises, natural

disasters, catastrophic events, and other major stressors that can increase perceived stress among parents and their vulnerability to PPD (e.g. Watanabe et al., 2016). Clearly, the COVID-19 pandemic is a significant and continuous stressor. Recent evidence points to its effect on mental health (e.g., Pfefferbaum and North, 2020), though more research is needed to explore the long-term effects in the context of parenthood (Mayopoulos et al., 2021). Studies conducted since the start of the pandemic have shown that the stress related to COVID-19 was associated with increased mental health problems among pregnant and postpartum women (e.g., Davenport et al., 2020; Khoury et al., 2021) and with PPD in particular (e.g. Hessami et al., 2020; Zanardo et al., 2020).

In contrast to the emphasis on the effect of the pandemic on mental health, few studies have focused on mother-infant bonding, yielding mixed outcomes. Most studies were cross-sectional, comparing women who gave birth during the pandemic to women assessed prior to its onset. While some studies reported worse bonding during the pandemic

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(Fernandes et al., 2021a, 2021b; Mayopoulos et al., 2021; Suzuki, 2020), others found no difference in bonding levels despite elevated PPD symptoms (Layton et al., 2021; Oskovi-Kaplan et al., 2021; Provenzi et al., 2021). A major limitation of most of these studies, beyond being cross-sectional, is that few accounted for pandemic-related anxiety that may be associated both with postpartum mental wellbeing and with the bonding experience.

Here we report on a secondary analysis of a longitudinal study of women assessed before and during the early phase of the pandemic. We asked whether a substantial external stressor, such as the COVID-19 pandemic, affects postpartum depression and bonding differently. In addition, we asked whether worry regarding an external threat (the pandemic) moderated the association between PPD and bonding.

2. Methods

2.1. Participants

One hundred and forty women (ages 21–43, $M = 32.0$, $SD = 4.74$), who gave birth at maternity wards of a large tertiary health center, responded to questionnaires at six months and 21 months postpartum. Forty women (29%) were primiparous, the others had 1–6 children ($m = 1.25$, $sd = 1.3$). One-hundred and thirty-five women (97%) were married, 133 (97%) Jewish, 102 (73%) had higher education and 63 (45%) and were above the average income stratum. Forty-one (29%) women responded to the survey while lockdown was in effect. Fifty-four (39%) had previously miscarried, 23 (16%) underwent infertility treatments, 79 (56%) had received epidural and 63 (45%) oxytocin. One-hundred and three women (74%) gave birth vaginally, 12 (9%) had elective C-sections, 18 (13%) had emergency C-sections and 7 (5%) – assisted labor. Seven women (5%) reported having a psychiatric diagnosis. None had additional children since enrolling in the study. Inclusion criteria were giving birth at least at 37 weeks gestation, a singleton pregnancy and Hebrew speaking. Women who gave birth again since data collection began were excluded from the study.

2.2. Procedure

The study was part of a larger longitudinal study preformed at the Rabin Medical Center, a tertiary university-affiliated medical center in the central region of Israel, run by the largest national health management organization in Israel, Clalit Health Services (for a detailed description and information about recruitment, data collection and dropout rates, see supplementary file and Handelzalts et al., 2021). Ethical approval was obtained from the Rabin Medical Center and the Academic College of Tel-Aviv Yafo IRBs. Data analyzed in this study was collected online prior to- and during COVID-19 time-points: (T1) Pre-COVID-19: Approximately 6 months after initial contact at the delivery ward (February 2018 to December 2019); (T2) During COVID-19: Approximately 21 months after initial contact at the delivery ward (April 2020 to January 2021). Demographic and obstetric data were collected at the beginning of the larger study in the maternity wards. Questionnaires and data output were generated using Qualtrics© 2019 (Qualtrics, Provo, UT; <http://www.qualtrics.com>).

2.3. Measures

Sociodemographic questionnaires included age, education, income, religious affiliation, country of origin, marital status, psychiatric diagnosis, and number of children.

COVID-19 worry and lockdown: The following question was answered on a five-point Likert scale ranging from 1 (*not at all*) to 5 (*very much*): “In general, how worried are you regarding the COVID-19 outbreak?”. Additionally, the timestamp of the responses was used to determine if participants responded to the questionnaires during lockdown. During data collection of the present study, three periods of

lockdown imposed in Israel, with varying levels of movement restriction, and with remote learning and work.

Obstetric Data included questions such as number of previous births, additional pregnancy since the study began, past abortions or miscarriage, infertility treatments and pregnancy risks. Data regarding labor were extracted from medical records: type of birth and administration of epidural and oxytocin.

Edinburgh Postnatal Depression Scale (EPDS; Cox et al., 1987) is a self-administered 10-item questionnaire for the screening of postnatal depressive symptoms. The MacDonald's ω internal consistency coefficient in the current study was 0.89 and 0.90 for first and second time points.

Postpartum Bonding Questionnaire (PBQ; Brockington et al., 2001) is a self-administered 25-item questionnaire assessing the mother's feelings or attitudes toward her baby. Two items relating to the risk of abuse were not included due to ethical considerations (Muzik et al., 2013). The McDonald's ω internal consistency in the current study was 0.89 for both time points.

2.4. Statistical analysis

Descriptive statistics are presented as means and standard deviation or counts and percentages. Pearson correlation coefficients were calculated between bonding and PPD, and between bonding and the dichotomous and continuous background variables. The non-parametric Kruskal-Wallis test was used to compare bonding across birth types. A path analysis model was constructed to compare correlations between bonding and PPD at T1 and T2, using bootstrapping with 1000 samples. Process model 1 was used to test the moderation hypothesis. All analyses were done using IBM SPSS v27.0, AMOS v27.0 and Process v3.5.

3. Results

Significant correlations were found between EPDS and PBQ at both time points (T1: $r = 0.64$, $p < 0.001$; T2: $r = 0.44$, $p < 0.001$). However, a model using Maximum Likelihood bootstrapping for comparing the correlations showed that the correlation between EPDS and PBQ was significantly weaker in the second time point (Difference = 0.20, $p = 0.05$).

At T2, zero-order Pearson correlations showed that PBQ correlated with EPDS ($r = 0.44$, $p < 0.001$) but not with COVID worry ($r = 0.04$, *n.s.*), although EPDS did correlate with COVID worry ($r = 0.30$, $p < 0.001$). To test the hypothesis that the link between PBQ and EPDS during COVID-19 is moderated by the level of concern regarding COVID-19, a regression model was used with PBQ as the dependent variable, and standardized EPDS, COVID worry, and their interaction term as predictors (Table 1). To determine which demographic or obstetric variables should be included as covariates in the model, correlations were run between the measures described in the participants section and bonding (age, being primiparous, having higher education, having above income level, presence of lockdown at the time of the survey, past abortions or miscarriage, infertility treatments, epidural and oxytocin administration and birth type). Since none of the correlations was significant, no covariates were included. Religious affiliation, marital status and psychiatric diagnosis were excluded from this preliminary analysis due to the small variability in these variables. The interaction term between EPDS and COVID-19 worry was significant, adding 4% to

Table 1
Regression model for testing the moderation hypothesis (N = 140).

Predictor	B	S.E.	P
EPDS	-0.123	0.18	0.520
COVID worry	0.03	0.07	0.534
EPDS x COVID worry	0.19	0.07	0.006

Note: $F(3, 136) = 15.4$, $R^2 = 0.25$, $*p < 0.05$ $**p < 0.01$.

the explained variance, such that more worry was associated with a stronger association between EPDS and PBQ (Fig. 1).

Simple slopes are shown in Fig. 1. Results indicate that the correlation between EPDS and PBQ becomes stronger as the moderator value increases – namely, as concern regarding COVID-19 increases.

4. Discussion

The findings in this study suggest that while mother-infant bonding and PPD were significantly correlated before and during the pandemic, as has been reported in past studies (e.g. Moehler et al., 2006; Muzik et al., 2013), the correlation significantly weakened during the pandemic. Furthermore, only PPD correlated with the worry associated with the pandemic, hence we suggest that the PPD-bonding association is weaker among women who were less concerned about the pandemic. These results point to the possibility that while PPD was associated with the existential threat of the pandemic, consistent with other reports (Iyengar et al., 2021; Spinola et al., 2020), mother-infant bonding was not. We speculate that as the relationship between mother and infant becomes more inveterate, mothers' emotions and cognitions toward their children may be less susceptible to external threats even as their mental health well-being (depression) reflects the stressful experience.

Moreover, these results are in line with O'Higgins et al. (2013) that found that while there was an association of PPD and bonding at one year postpartum, bonding measured shortly after birth was a better predictor of bonding at one year than PPD at the same time point. Thus, emotions underlying mood symptoms and bonding may share common antecedents and may influence each other, but they may represent two different mental constructs (O'Higgins et al., 2013).

Our results are also similar to a recent study of prenatal attachment to the fetus (a related but different construct than bonding) during COVID-19 lockdown. It was found that COVID-19-risk perception attenuated the association between trait anxiety and prenatal attachment (Craig et al., 2021). Although COVID-19 risk perception was associated with prenatal attachment in that study, it reinforces the possibility that mothers' emotions and cognitions regarding their fetus and later infant may be less sensitive than their affective state (PPD levels) to external threats such as the COVID-19 pandemic.

Regarding PPD, the study results are in line with other studies that reported that COVID-19 related worries are associated with higher levels of PPD (Spinola et al., 2020). The fact that higher PPD scores were associated with COVID-19 worries strengthens the conclusion regarding the susceptibility of PPD to ecological pressures. Thus, it seems that the degree to which COVID-19 increases mental health risk in postpartum women may be associated with their perception of risks present during the pandemic (Iyengar et al., 2021).

This study is not without limitations. First, it could be argued that the difference in bonding-PPD correlations between T1 and T2 reflects the passage of time, and developmental age of the infant, rather than the effects of COVID-19 per se. Second, the sample is fairly homogenous-most of the participants were middle-classed, married, multiparous, Jewish, educated women. This is not a representative Israeli sample in terms of demographics and is the result of sampling in one tertiary healthcare center in the central district of Israel. In addition, we had approximately 50% attrition between timepoints resulting in a small sample size, thus limiting the generalizability of the results. Furthermore, we didn't control for infant characteristics that could be associated with bonding such as temperament and sleep. Finally, although highly reliable and valid, the use of self-report measures limits the predictive validity vis-à-vis actual parenting behaviors.

In sum, this study suggests that emotions and cognitions related to motherhood, such as mother-infant bonding, may be more resilient to outside pressures like the COVID-19 pandemic related worries, than affective states such as PPD. Future research could focus on this differential effect regarding issues such as infant development that are associated with PPD as well as with bonding.

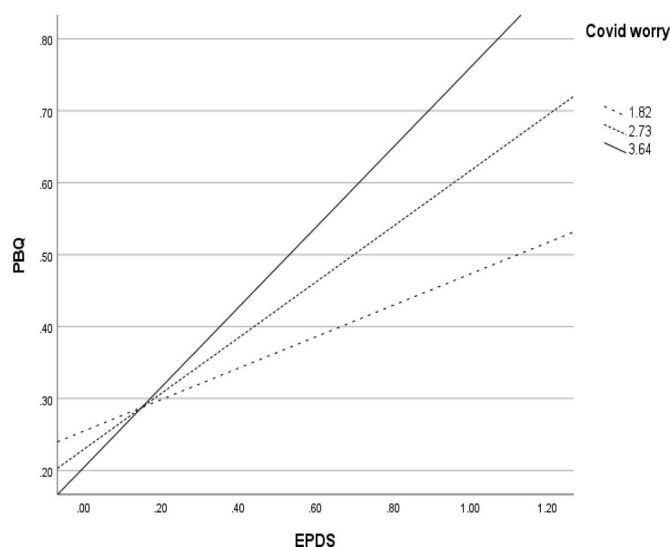


Fig. 1. Simple slopes of the moderation model. Regression lines of the association between EPDS (Edinburgh Postpartum Depression Scale) and PBQ (Postpartum Bonding Questionnaire) are shown for M - SD (1.82), M (2.73) and M + SD (3.64) values of COVID-19 worry item.

Author statement

Jonathan E.Handelzalts: Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing, Visualization, Supervision. Ilana S. Hairston: Writing – original, Writing – review & editing. Sigal Levy: Methodology, Formal Analysis, Writing – original, Writing – review & editing. Naomi Orkaby: Project administration, Analysis. Haim Krisi: Writing – review & editing. Yoav Peled: Conceptualization, Writing – review & editing, Visualization, Supervision.

Declaration of competing interest

None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jpsychires.2022.02.039>.

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