Practical resources for effective postpartum parenting (PREPP): a randomized controlled trial of a novel parent-infant dyadic intervention to reduce symptoms of postpartum depression

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BACKGROUND: There is little known about the effectiveness of psychological interventions to prevent postpartum depression that focus on the birthing parent and infant dyad. Risk factors for PPD include depression during pregnancy, low parenting self-efficacy, and disrupted parental nocturnal sleep. The brief Practical Resources for Effective Postpartum Parenting (PREPP) intervention is designed for pregnant individuals at-risk for postpartum depression, providing them with 1) caregiving strategies aimed at reducing infant fuss and cry behavior and increasing infant sleep, 2) self-reflection and mindfulness skills and 3) psychoeducation about the postpartum period and infant behavior. The aims are to set more realistic postpartum expectations, enhance parenting confidence and sleep via supporting infant regulatory behavior, improve parental affect regulation and ultimately reduce the risk of postpartum depression.

OBJECTIVE: Assess the effectiveness of PREPP compared to enhanced treatment as usual in reducing symptoms of depression and anxiety and episodes of infant fuss and cry behavior and improving parental and infant sleep in the early postpartum.

STUDY DESIGN: A randomized controlled trial was conducted of 175 pregnant individuals. Inclusion criteria were standard prenatal care for a singleton pregnancy, aged 18 to 45 and at increased risk of PPD as determined by a score of ≥19 on the Predictive Index of Postnatal Depression or ≥7 on the Edinburgh Postnatal Depression Scale. Participants assigned to the PREPP group (n=88) received 3 coaching sessions and 2 phone check-ins. Participants assigned to the enhanced treatment as usual group (n=87) received 3 sessions which included psychoeducation, mood assessments, and clinical referral and follow-up as indicated. Assessments were conducted at 28 to 32 weeks and 34 to 39 weeks gestation, and at 6, 12 and 16 weeks postpartum and included measures of parental depression, anxiety and sleep (Edinburgh Postnatal Depression Scale, Patient Health Questionnaire (PHQ-9), Hamilton Rating Scales of Depression and Anxiety and Pittsburgh Sleep Quality Index) and infant sleep and fuss and cry behavior (Baby Day Diary).

RESULTS: Compared to enhanced treatment as usual, PREPP significantly reduced depressive symptoms at 6, 12 and 16 weeks postpartum with medium to large effect sizes (d=0.7-0.98). Compared to enhanced treatment as usual, participants receiving PREPP reported less of a decline in sleep quality at 6 weeks postpartum (p=0.035) and the effect size was large (d=0.83). Moreover, parents receiving the PREPP intervention reported less infant fussing and crying, with the largest effect for morning crying ($p<.001$; d=-1.48).

CONCLUSION: The results provide evidence that PREPP, initiated during pregnancy, reduced symptoms of parental depression and infant fuss and cry behavior in the early postpartum, compared to enhanced treatment as usual, in a sample at-risk for postpartum depression.

Key words: anxiety, infant fuss and cry, pregnancy, prevention, postpartum depression, randomized controlled trial

Introduction

Postpartum depression (PPD) affects 10% to 15% of birthing individuals and is usually defined as occurring up to one year postpartum.[1] It exerts a significant burden on those affected, including children and the wider family. In particular, when left untreated, it may impact the relationship between the birthing parent and infant; PPD is associated with compromised parent*-infant bonding, interactions characterized by disengagement, parental insensitivity and inconsistent structuring of the environment for infants' emerging autonomy.[2]

However, there are challenges to treating PPD such that it may often go untreated. This is likely driven by a variety of factors including stigma and difficulties in accessing effective treatment.[3] There is also some evidence that while medication is often required, particularly in more severe cases of PPD, that psychological interventions may be preferable to those experiencing PPD, in part due to concerns about the impact of medication on the breastfeeding infant.[4]

Preventing PPD prior to its onset could help to mitigate these adverse outcomes and the aforementioned challenges with PPD treatment.[5] The US Preventive Services Taskforce (USPSTF) specifically recommend that 'clinicians provide or refer pregnant and postpartum persons who are at increased risk of perinatal depression (those less than

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AJOG MFM at a Glance

Why was this study conducted?

To test the efficacy of the PREPP intervention (compared to enhanced treatment as usual) in reducing symptoms of depression and anxiety in those at risk for postpartum depression.

Key findings

- PREPP reduced symptoms of depression from baseline (during pregnancy) at 6, 12 and 16 weeks postpartum.
- Sleep quality did not decline between pregnancy and 6 weeks postpartum in birthing parents receiving PREPP.
- PREPP improved infant fuss and cry behavior at 16 weeks postpartum.

What does this add to what is known?

This is the first study to provide evidence that a dyadically-oriented, parent-infant intervention, commenced during pregnancy, reduces symptoms of depression in the postpartum.

one year postpartum who do not have a current diagnosis of depression but are at increased risk of developing depression) to counseling interventions', in response to evidence of moderate benefit in preventing perinatal depression from such interventions.[6]

Yet there remains a relative paucity of evidence for interventions to prevent PPD, in particular those that focus on the unique parent-infant dyad.[7] One of the strongest risk factors for PPD is depression during pregnancy[8] and there is also evidence that infant behavior such as irritability and crying may in fact be a precipitating and/or maintaining factor, mediated by low parenting self-efficacy and disrupted parental sleep.[9] As such, PREPP (Practical Resources for Effective Postpartum Parenting) is a parent-infant dyadic intervention that aims to prevent PPD in those at-risk. It does so by providing 1) caregiving techniques to reduce infant cry and fuss behavior and increase infant sleep, 2) self-reflective and mindfulness-based skills to aid in the transition to parenthood and improve affect regulation and 3) psychoeducation to create realistic expectations of the postpartum and infant behavior. PREPP spans the third trimester of pregnancy through 6 weeks postpartum (refer to Supplementary Table 1).

Results of 2 pilot randomized controlled trials (RCTs) of the PREPP intervention indicated that it was well tolerated.[9,10] Moreover, at 6 weeks postpartum, there were reduced parental symptoms of depression and anxiety and infants had fewer bouts of fussing and crying in one of the RCTs of 54 dyads, compared to an enhanced treatment as usual (ETAU) group (who received a PPD information session, brief clinical mood assessment and referral for treatment if needed); there was less evidence of an effect seen at 12 and 16 weeks postpartum.[9]

Thus, the aim of this current study was to test PREPP's effectiveness, compared to ETAU, in a larger and sufficiently powered sample of pregnant individuals at-risk for PPD. The hypothesis was that in the early postpartum, those receiving PREPP would report fewer symptoms of depression and anxiety, fewer episodes of infant fuss and cry behavior, and improved parental and infant sleep.

**the words 'parent' and 'parental' refer specifically to birthing parents throughout.*

Methods

Updated Consolidated Standards Of Reporting Trials (CONSORT) were followed.[11] This trial was registered with clinicaltrials.gov: NCT03283254 on 14 September 2017 (https://classic.clinicaltrials.gov/ct2/show/NCT03283254).

Procedure

Pregnant individuals were recruited by informed consent through the hospital's Department of Obstetrics and Gynecology. They were initially screened for eligibility by telephone between 20 and 28 weeks gestation, between 22 February 2018-1 June 2023. Therefore, some procedures were conducted during the COVID-19 pandemic. Inclusion criteria were healthy pregnancy, receipt of standard prenatal care, between 18 and 45 years of age, and a score of ≥19 on the Predictive Index of Postnatal Depression (PIPD: a 17−item questionnaire focusing on risk factors for PPD such as social risk factors, for example poor social support, and current self-report of feeling anxious or low in mood)[12] or ≥7 on the Edinburgh Postnatal Depression Scale (EPDS):[13] scores that indicate risk for PPD. Exclusion criteria were self-report of any substance use during pregnancy (including alcohol, tobacco and cannabis), English non-fluency, currently receiving psychological or psychiatric treatment, and a medically complicated or non-singleton pregnancy (but history of preterm birth, current cerclage procedure and current diabetes diagnosis were not excluded). A second screening assessment was conducted in person or via online video visit during the pandemic (due to the need for social distancing), during which a more in depth clinical assessment involving the Mini International Neuropsychiatric Interview (MINI)[14] was conducted. Those who met criteria for Major Depressive Disorder, Bipolar Disorder or Psychotic Disorder were excluded. Participants were randomized 1:1 by a computer-generated random assignment schedule to PREPP or ETAU and informed of their treatment group assignment by their assigned clinician.

Following randomization, 5 assessments were conducted between 28 to 32 weeks of gestation, 34 to 39 weeks gestation and at 6, 12, and 16 weeks postpartum. The 12-week postpartum assessment was conducted entirely by telephone. The other assessments were conducted in person and remotely via video during the pandemic.

The principles on which the PREPP intervention is designed have been previously reported.[9] The components and timing of PREPP sessions are provided in Supplementary Table 1.

PREPP sessions were delivered by mental health clinicians trained and certified in its delivery (Clinical Psychologists, Psychiatric Nurse Practitioners and Clinical Social Workers) using a standardized clinical protocol. PREPP was delivered as three 45 to 60 minute sessions and 2 phone check-ins ranging from 15 to 30 minutes. The 45 to 60 minute sessions were designed to be delivered in-person but during the pandemic switched to video visits. Forty-three percent of the first PREPP sessions and 42% of the second and third sessions took place prior to the pandemic and were in-person. The first PREPP session was conducted at 28 to 32 weeks gestation, the second at 34 to 39 weeks gestation and the third at 6 weeks postpartum (+/- 2 weeks). Phone check-ins were provided within the first 3 days postpartum (+/- 2 days) and 2 weeks postpartum (+/- 1 week).

ETAU comprised PPD psychoeducation, mood assessments, and referral for treatment if needed or requested by the participant. Three sessions, which were delivered via standardized clinical protocol, were delivered by trained mental health clinicians (Psychiatrists or Clinical Psychologists) at the same time points as the 3 PREPP sessions. Forty-seven percent of the first ETAU sessions, 48% of the second and 37% of the third sessions were prior to the pandemic and delivered in-person. Those in ETAU who received mental health referrals also received additional clinical follow-up to coordinate care between the participant and provider to whom they were referred; 30% of those in ETAU accepted a referral.

All study procedures were approved by the Institutional Review Board on 26 January 2017. All data from the study are available upon reasonable request.

Outcome measures

Parental depression, anxiety, and sleep. These were measured at baseline (28−32 weeks gestation) and at 6, 12, and 16 weeks postpartum.

Edinburgh Postnatal Depression Scale (EPDS)[13]: ten item self-report scale used during the peripartum. Each item is scored on a 4-point scale (from 0 to 3), giving a total score out of 30, with higher scores indicating higher levels of depressive symptoms.

Patient Health Questionnaire (PHQ-9)[15]: depressive symptoms were also measured using the nine self-report items of the PHQ that are based on the DSM-IV criteria for depression. This is also a 4-point scale (from 0 to 3), giving a total score of 27, where higher scores indicate higher levels of symptoms. It has been validated for use in the peripartum.[16]

Hamilton Rating Scales of Depression (HamD)[17] and Anxiety (HamA)[18]: also frequently used in the perinatal period,[19] utilizing trained rater/interviewer assessment as opposed to self-report, these measures index symptomatology over a 2-week period. The 24 item HamD has a total score of 74 and the 14 item HamA 56; higher scores indicate greater levels of symptoms.

Pittsburgh Sleep Quality Index (PSQI)[20]: self-report measure of sleep in the past one month. There are 19 items informing 7 component scores: sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication and daytime dysfunction. It has previously been used in the peripartum.[21-23] A global score (sum of all component scores) was used in this study, providing a maximum score of 21; higher scores indicate poorer sleep quality.

Infant sleep and behavior

These were measured at 6 and 16 weeks postpartum.

Baby Day Diary[24]: provided information about infant sleep and fuss and cry behavior. Participants were asked to complete the diary over four 24-hour periods, recording the duration and frequency of fussing, crying and sleeping behaviors,[33] with a mean taken over the 4 periods. This measure and method of utilizing the data has been well validated[25] and does not seem to be influenced by parental depressive symptoms.[26]

Statistical analysis

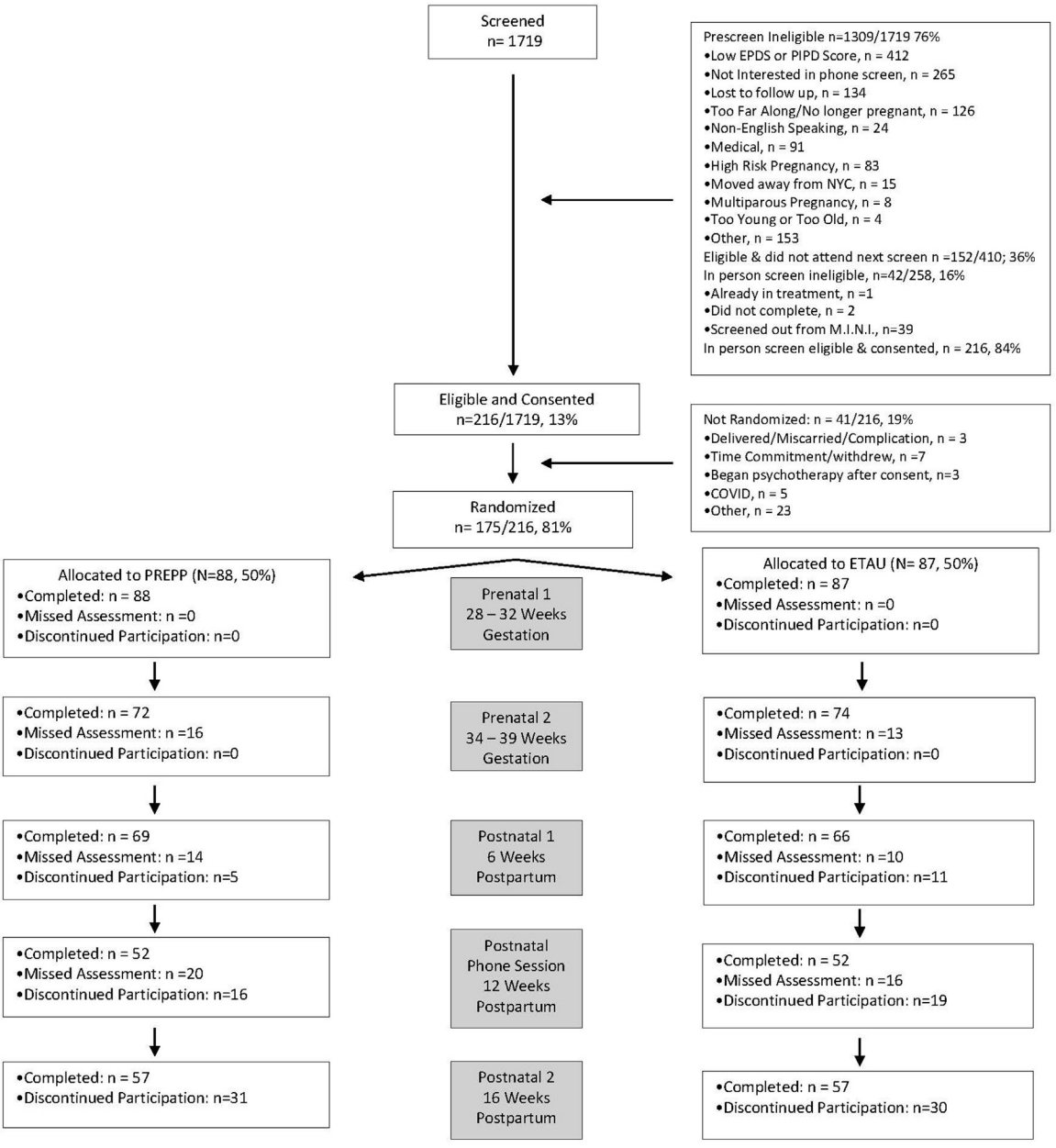
The primary analysis was conducted to test the effect of PREPP on parental depression, anxiety and sleep. The trial had 80% power at a type I error rate of 5% to detect a medium effect size d = 0.5 with 80% retention rate. All analyses followed the intention-to-treat principle in that all participants who were enrolled and randomly allocated to treatment were included in the analysis and were analyzed in the groups to which they were randomized. Analyses were conducted using R (version 4.3.1). Wilcoxon rank sum and Fisher's exact tests were used to compare continuous and categorical demographic characteristics between PREPP and ETAU groups. Levels of completion of the outcome measures were also compared between groups. Assuming data were missing at random, generalized linear mixed-effect regression models were implemented, with timepoints, treatment groups and interaction of timepoints and treatment groups included as fixed effects and participants included as a random effect. Change scores were used in the analyses to account for any initial differences at baseline and more accurately reflect the effect of the intervention on within-participant change. Type III ANOVA test was conducted to examine the significance of model coefficients. The comparison within timepoints and treatment groups was tested using the z-test. *P* values <.05 were considered significant.

Results

Participant characteristics

The flow of participants through the study is provided in Figure according to CONSORT reporting guidelines.[11] Of 1719 individuals screened, 175 (10.2%) were randomized: 88 participants to PREPP and 87 to ETAU, of whom 72 (81.8%) and 74 (85.1%) respectively completed the first prenatal follow up assessment. For the 3 postnatal assessments, this dropped to between 52 and 69 individuals in each group. Table 1 shows the demographic characteristics between PREPP and ETAU groups;

FIGURE
CONSORT flow diagram.



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there were no significant differences between groups. Levels of missingness across all measures are provided in Supplementary Table 3; these broadly reflected participation rates at each assessment (Figure) but for Baby Day Diary, only around 40% of participants completed this. 84% of participants attended at least 2 out of 3 intervention sessions across both groups. (Supplementary Table 2).

Parental depression, anxiety, and sleep

Table 2 displays the results of the linear mixed-effect model comparing changes from baseline in parental depression, anxiety and sleep scores between PREPP and ETAU at 6, 12, and 16 weeks postpartum. There was a significant decline in mean EPDS score from baseline to 16 weeks postpartum in the PREPP group (mean difference -1.35; 95% confidence interval (CI) -2.04, -0.66; $p<.001$), which was not observed in ETAU. However, the overall significance level across time points was

TABLE 1
Participant characteristics (N=175)

	PREPP (N=88)	ETAU (N=87)
Age (years)- mean (SD)	31.15 (5.51)	30.16 (6.8)
Pre pregnancy BMI- mean (SD)	30.21 (6.00)	30.07 (4.99)
Primiparity- n (%)	49 (57[a])	60 (69)
Medicaid coverage- n (%)	50 (57)	50 (57)
Race- n (%)		
American Indian/Alaskan	0 (0)	2 (2)
Asian	3 (3)	4 (5)
Black/African American	15 (17)	11 (13)
White/Caucasian	22 (25)	15 (17)
Biracial	7 (8)	3 (3)
Native Hawaiian/Pacific Islander	1 (1)	0 (0)
Other	40 (45)	52 (60)
Ethnicity- n (%)		
Hispanic/Latina	54 (61)	54 (62)
Not Hispanic/Latina	34 (39)	33 (38)
EDPS score at screening[b]- mean (SD)	8.55 (4.8)	7.45 (3.96)
Baseline[c] EPDS score- mean (SD)	6.59 (5.1)	5.52 (4.36)
Baseline[c] PHQ9 score- mean (SD)	7.56 (5.4)	6.61 (4.58)
Baseline[c] HamD score- mean (SD)	5.38 (4.42)	4.17 (3.79)
Baseline[c] HamA score- mean (SD)	5.58 (4.14)	4.72 (3.91)
Baseline[c] PSQI score- mean (SD)	7.35 (3.98)	6.83 (3.4)
Infant sex- n (%)		
Male	41 (47)	44 (51)
Female	47 (53)	43 (49)
Gestational age (weeks)- mean (SD)	38.92 (1.43)	38.82 (1.68)
Birth weight (grams)- mean (SD)	3,296.64 (545.54)	3,354.13 (559.52)

EPDS, Edinburgh Postnatal Depression Scale; *PHQ-9*, Patient Health Questionnaire; *HamD*, Hamilton Rating Scale of Depression; *HamA*, Hamilton Rating Scale of Anxiety; *PSQI*, Pittsburgh Sleep Quality Index.

[a] Denominator is N=86 due to missing parity information for 2 participants.; [b] Before 28 weeks gestation.; [c] 28-32 weeks gestation.

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p=.104, most likely as a result of a reduction in mean EPDS in both groups at 12 weeks. On the PHQ-9 and HamD, there was a treatment group by time interaction such that PREPP versus ETAU participants had lower depression scores across time points (p=.006 and p=.029, respectively). Effect sizes for depression (across the 3 measures) were medium to large (d=0.7−0.98). There was a significant drop in anxiety symptoms (HamA) with PREPP and to a lesser extent, with ETAU; there was no significant difference between PREPP and ETAU (p=.267) at 16 weeks postpartum.

Sleep quality declined significantly from pregnancy (baseline) to 6 weeks postpartum in ETAU (p<.001) but did not change in PREPP; the groups significantly differed in this outcome (p=.035) and the effect size for this was large (d=0.83). At 12 and 16 weeks postpartum, there was an improvement in sleep quality compared to baseline with PREPP (12 weeks mean difference -1.28; 95% CI -2.16, -0.39; p=.005 and 16 weeks -1.13; 95% CI -2.01, -0.25; p=.012) though not with ETAU; the difference between groups in sleep quality was not significant (p=.066 and p=.311 at 12 and 16 weeks respectively). The mean scores for each measure at each assessment point in both PREPP and ETAU groups are provided in Supplementary Table 4.

Infant sleep and behavior

The results of the linear mixed-effect model of changes in infant sleep and fuss and cry behavior from 6 to 16 weeks postpartum in both PREPP and ETAU are provided in Table 3. There were significant improvements reported in all outcomes on the Baby Day Diary between 6 and 16 weeks postpartum in the PREPP group. However, only changes in 3 of these outcomes were significantly greater in PREPP than ETAU; there was a treatment group by time interaction such that PREPP versus ETAU participants had greater reductions in total minutes of morning crying, mean number of daily episodes of fussing or crying and mean daily minutes of fussing and crying across time points (p<.001, p=.004 and p=.006, respectively). The effect sizes for the changes in these outcomes were large (d=-1.1 to -1.48). The mean scores for each measure at each assessment point in both PREPP and ETAU groups are provided in Supplementary Table 5.

Discussion

PREPP reduced depressive symptoms at 6, 12 and 16 weeks postpartum compared to ETAU, with moderate to large effect sizes but did not significantly reduce anxiety symptoms. Regarding parental sleep, there was a large effect of PREPP at 6 weeks postpartum, whereby the ETAU group reported poorer sleep quality than PREPP; the effect size for this was large. PREPP significantly improved parental reports of infant fuss and cry behavior and sleep but only outcomes related to fussing and crying were significantly improved relative to

TABLE 2
Linear mixed-effect model of changes in parental depression, anxiety, and sleep scores between PREPP and ETAU (N=175)

	PREPP				ETAU				Difference between treatments					ANOVA test for interaction term	
Outcome	Estimated mean/ mean difference from baseline	95% confidence interval		p value	Estimated mean/ mean difference from baseline	95% confidence interval		p value	Estimated difference between mean difference from baseline	95% confidence interval		p value	Effect size	Chi square	p value
EPDS															
Baseline[a] mean (SE)	5.04 (0.49)				4.36 (0.43)									6.17	.104
Baseline to 6 weeks	−0.6	−1.26	0.05	.07	−0.32	−0.93	0.29	.304	−0.28	−1.18	0.61	.533	0.95		
Baseline to 12 weeks	−1.53	−2.22	−0.85	<.001[b]	−0.62	−1.26	0.03	.062	−0.92	−1.86	0.03	.057	0.81		
Baseline to 16 weeks	−1.35	−2.04	−0.66	<.001[b]	−0.32	−0.96	0.32	.331	−1.03	−1.97	−0.1	.031[b]	0.79		
PHQ-9															
Baseline mean (SE)	6.36 (0.49)				5.64 (0.45)									12.32	.006[b]
Baseline to 6 weeks	−1.16	−1.9	−0.42	.002[b]	−0.21	−0.96	0.53	.573	−0.94	−1.99	0.11	.078	0.85		
Baseline to 12 weeks	−2.24	−3.02	−1.46	<.001[b]	−0.45	−1.24	0.35	.27	−1.79	−2.90	−0.68	.002[b]	0.70		
Baseline to 16 weeks	−1.86	−2.64	−1.09	<.001[b]	−1.56	−2.29	−0.83	<.001[b]	−0.3	−1.37	0.76	.577	0.98		
HamD															
Baseline mean (SE)	4.09 (0.39)				3.16 (0.32)									9.02	.029[b]
Baseline to 6 weeks	−0.85	−1.42	−0.29	.003[b]	−0.17	−0.67	0.34	.519	−0.69	−1.44	0.07	.075	0.84		
Baseline to 12 weeks	−1.1	−1.71	−0.48	<.001[b]	−0.15	−0.43	0.72	.617	−1.24	−2.08	−0.40	.004[b]	0.70		
Baseline to 16 weeks	−1.34	−1.93	−0.76	<.001[b]	−0.43	−0.96	0.1	.114	−0.92	−1.71	−0.13	.023[b]	0.78		
HamA															
Baseline mean (SE)	4.09 (0.41)				3.63 (0.37)									3.35	.34
Baseline to 6 weeks	−1.08	−1.64	−0.51	<.001[b]	−0.54	−1.08	−0.01	.048	−0.53	−1.31	0.24	.179	0.87		
Baseline to 12 weeks	−1.08	−1.7	−0.47	<.001[b]	−0.33	−0.93	0.26	.269	−0.75	−1.6	0.1	.085	0.81		
Baseline to 16 weeks	−1.16	−1.75	−0.57	<.001[b]	−0.70	−1.26	−0.13	.016[b]	−0.46	−1.28	0.35	.267	0.89		
PSQI															
Baseline mean (SE)	7.01 (0.37)				6.55 (0.35)									5.61	.132
Baseline to 6 weeks	0.21	−0.7	1.11	.654	1.62	0.66	2.57	<.001[b]	−1.41	−2.72	−0.1	.035[b]	0.83		
Baseline to 12 weeks	−1.28	−2.16	−0.39	.005[b]	−0.06	−1.00	0.88	.895	−1.21	−2.50	0.08	.066	0.83		
Baseline to 16 weeks	−1.13	−2.01	−0.25	.012[b]	−0.49	−1.37	0.39	.28	−0.64	−1.89	0.60	.311	0.91		

EPDS, Edinburgh Postnatal Depression Scale; *PHQ-9*, Patient Health Questionnaire; *HamD*, Hamilton Rating Scale of Depression; *HamA*, Hamilton Rating Scale of Anxiety; *PSQI*, Pittsburgh Sleep Quality Index.

[a] 28-32 weeks gestation.; [b] $p<.05$ was considered significant.

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TABLE 3

Linear mixed-effect model of infant sleep and behavior on Baby Day Diary between PREPP and ETAU (N=175)

	PREPP				ETAU				Difference between treatments					ANOVA test for interaction term	
Outcome	Estimated mean/mean difference from baseline	95% confidence interval		p value	Estimated mean/mean difference from baseline	95% confidence interval		p value	Estimated difference between mean differences from baseline	95% confidence interval		p value	Effect size	Chi square	p value
Mean daily minutes of fussing or crying															
6 weeks mean (SE)	162.91 (11.79)				120.21 (11.50)									7.7	.006[a]
6 weeks to 16 weeks	−60.55	−82.89	−38.2	<.001[a]	−17.33	−39.4	4.74	.121	−43.21	−74.62	−11.8	.008[a]	−1.1		
Mean number of daily episodes of fussing or crying															
6 weeks mean (SE)	4.14 (0.32)				3.37 (0.31)									8.36	.004[a]
6 weeks to 16 weeks	−1.66	−2.35	−0.96	<.001[a]	−0.23	−0.94	0.48	.518	−1.42	−2.42	0.43	.006[a]	−1.16		
Mean episode length of fussing or crying (minutes)															
6 weeks mean (SE)	12.94 (1.19)				10.1 (1.7)									1.22	.27
6 weeks to 16 weeks	−3.03	−4.92	−1.14	.002[a]	−1.57	−3.44	0.29	.096	−1.45	−4.11	1.2	.278	−0.45		
Total minutes of morning crying															
6 weeks mean (SE)	74.87 (7.75)				23.87 (7.52)									15.31	<.001[a]
6 weeks to 16 weeks	−54.87	−74.53	−35.2	<.001[a]	−0.23	−20.3	19.85	.982	−54.64	−82.75	−26.54	<.001[a]	−1.48		
Total minutes of afternoon crying															
6 weeks mean (SE)	77.75 (10.09)				61.21 (9.9)									3.03	.082
6 weeks to 16 weeks	−38.72	−59.17	−18.28	<.001[a]	−13.55	−34.46	7.35	.2	−25.17	−54.41	4.07	.09	−0.71		
Total minutes of evening crying															
6 weeks mean (SE)	80.21 (12.5)				81.92 (12.25)									0.0004	.985
6 weeks to 16 weeks	−29.51	−55.72	−3.31	.028[a]	−29.87	−56.67	−3.07	.03[a]	0.36	−37.13	37.84	.985	0.01		
Total minutes of night crying															
6 weeks mean (SE)	39.18 (10.01)				35.05 (9.86)									0.06	.805
6 weeks to 16 weeks	−17.19	−36.13	1.75	.074	−20.5	−39.88	−1.12	.039[a]	3.31	−23.79	30.41	.807	0.102		
Total minutes awake at night															
6 weeks mean (SE)	321.82 (32.24)				357.45 (30.98)									1.6	.206
6 weeks to 16 weeks	−91.11	−165.57	−16.64	.017[a]	−157.06	−231.05	−83.07	<.001[a]	65.95	−39.03	170.93	.214	0.48		
Length of longest sleep at night (minutes)															
6 weeks mean (SE)	252.59 (15.18)				239.51 (14.55)									0.01	.942
6 weeks to 16 weeks	36.81	0.13	73.5	.049[a]	34.94	−1.58	71.45	.06	1.88	−49.89	53.64	.943	0.03		

[a] $p<.05$ was considered significant.

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ETAU, with the largest effect seen for morning crying.

Results in context

To our knowledge, this is the first dyadic intervention focused on parental caregiving with the aim of reducing depressive symptoms in pregnant individuals at risk for PPD. While there are a number of successful parent-infant interventions addressing the infant behaviors of fussing, crying and sleep, few have examined the impact on PPD.[9] An RCT of an educational intervention which did not begin during pregnancy but in the early postpartum and focused on infant crying and sleep with 781 parent-infant dyads, reduced parental depressive symptoms at 6 months postpartum but failed to demonstrate an effect of the intervention on the sleep of the birthing parent.[27]

There are other preventive interventions beginning during pregnancy that have not focused specifically on the parent-infant dyad. A cognitive behavioral intervention commenced during pregnancy in 217 Latina participants reduced depressive symptoms during pregnancy but not postpartum.[28] Another RCT of interpersonal therapy involving 205 pregnant individuals reduced depressive symptoms at 6 months postpartum.[29]

Clinical and research implications

The findings of this study support PREPP as an evidenced-based dyadic intervention reducing depression symptoms in pregnant individuals at risk for PPD. Further research may usefully focus on the mechanisms underlying the mood improvements. The extent to which the reduction in depressive symptoms was mediated by reduced fussing and crying (and other potential factors related to infant behavior) requires further examination. There remains an imperative to investigate further the extent to which improvements in parental mood and infant behavior may be maintained during longer periods of follow-up.

Strengths and limitations

Although the study recruited a relatively socio-economically and racially diverse sample of participants (albeit they had to be fluent in English), levels of depression and anxiety symptoms were relatively low. However, these levels of symptoms were similar to that reported in trials of other well-known preventive interventions which, like the current study, excluded from enrollment those pregnant individuals with current clinically significant depression.[28,29] Thus, it remains unclear the extent to which the findings may generalize to a sample with higher levels of distress. Retention in the study (65% of those randomized) remains comparable to or even higher than in many other PPD prevention interventions.[30,31] This level of retention and the beneficial effects of the intervention were especially remarkable given that a significant proportion of the intervention and assessments were conducted during the COVID-19 pandemic: a time of significant uncertainty, heightened distress (manifesting in elevated anxiety and depressive symptoms seen in many perinatal samples[32]) and potentially more urgent and competing demands which could have distracted participants from engagement with the intervention. Reasons for the relatively low attrition in PREPP have been discussed previously.[9] Unfortunately sample size precludes any exploration via subgroup analyses of differential outcomes between those participating during the pandemic versus those not and those participating in person versus remotely.

Conclusions

In summary, this study found evidence, as hypothesized, that a brief, parent-infant dyadic intervention commenced during pregnancy reduced parental depressive symptoms, improved parental sleep and reduced infant fuss and cry behavior in the early postpartum in a population at-risk for PPD. However, there was insufficient evidence to reject the null hypothesis of no difference between PREPP and ETAU in reducing the outcome of parental anxiety and improving the outcome of infant sleep. These findings provide insights into how interventions such as these may be utilized at both an individual and population level to prevent PPD and its adverse impacts on the developing infant.

Data sharing statement

Authors are willing to share the data of the study upon request of the Editors. ■

CRediT authorship contribution statement

Myrriam D. Grubb: Writing – review & editing, Project administration, Data curation. **Claire A. Wilson:** Writing – original draft. **Zhijun Zhang:** Writing – review & editing, Formal analysis. **Grace Liu:** Writing – review & editing, Data curation. **Seonjoo Lee:** Writing – review & editing, Supervision, Methodology. **Catherine Monk:** Writing – review & editing, Funding acquisition, Conceptualization. **Elizabeth A. Werner:** Supervision, Project administration, Funding acquisition, Conceptualization.

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Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.ajogmf.2024.101526.

References

1. Liu X, Wang S, Wang G. Prevalence and risk factors of postpartum depression in women: a systematic review and meta-analysis. J Clin Nurs 2022;31(19-20):2665–77.
2. Field T. Postpartum depression effects on early interactions, parenting, and safety practices: a review. Infant Behav Develop 2010;33(1):1–6.
3. Dagher RK, Bruckheim HE, Colpe LJ, Edwards E, White DB. Perinatal depression: challenges and opportunities. J Womens Health (Larchmt) 2021;30(2):154–9.
4. Dennis C-L, Chung-Lee L. Postpartum depression help-seeking barriers and maternal treatment preferences: a qualitative systematic review. Birth 2006;33(4):323–31.
5. Muñoz RF, Le HN, Barrera AZ, Pineda BS. Leading the charge toward a world without depression: perinatal depression can be prevented. Arch Womens Ment Health 2021;24(5):807–15.
6. US Preventive Services Task Force. Interventions to prevent perinatal depression: US

Preventive Services Task Force Recommendation Statement. JAMA 2019;321(6):580–7.
7. Werner E, Miller M, Osborne LM, Kuzava S, Monk C. Preventing postpartum depression: review and recommendations. Arch Womens Ment Health 2015;18(1):41–60.
8. Howard LM, Molyneaux E, Dennis C-L, Rochat T, Stein A, Milgrom J. Non-psychotic mental disorders in the perinatal period. The Lancet 2014;384(9956):1775–88.
9. Werner EA, Gustafsson HC, Lee S, et al. PREPP: postpartum depression prevention through the mother-infant dyad. Arch Womens Ment Health 2016;19(2):229–42.
10. Scorza P, Monk C, Lee S, Feng T, Berry OO, Werner E. Preventing maternal mental health disorders in the context of poverty: pilot efficacy of a dyadic intervention. Am J Obstet Gynecol MFM 2020;2(4):100230.
11. Schulz KF, Altman DG, Moher D. The Consort Group. CONSORT 2010 Statement: Updated Guidelines for Reporting Parallel Group Randomised Trials. PLOS Medicine 2010;7(3):e1000251.
12. Cooper PJ, Murray L, Hooper R, West A. The development and validation of a predictive index for postpartum depression. Psychol Med 1996;26(3):627–34.
13. Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression: development of the 10-item Edinburgh Postnatal Depression Scale. Br J Psychiatry 1987;150(6):782–6.
14. Sheehan DV, Lecrubier Y, Sheehan KH, et al. The Mini-International Neuropsychiatric Interview (M.I.N.I.): the development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. J Clin Psychiatry 1998;59(Suppl 20):22–33. quiz 34-57.
15. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. J Gen Internal Med 2001;16(9):606–13.
16. Wang L, Kroenke K, Stump TE, Monahan PO. Screening for perinatal depression with the Patient Health Questionnaire depression scale (PHQ-9): a systematic review and meta-analysis. Gen Hosp Psychiatry 2021;68:74–82.
17. Hamilton M. A rating scale for depression. J Neurol Neurosurg Psychiatry 1960;23(1):56–62.
18. Hamilton M. The assessment of anxiety states by rating. Br J Med Psychol 1959;32 (1):50–5.
19. Sambrook Smith M, Cairns L, Pullen LSW, Opondo C, Fellmeth G, Alderdice F. Validated tools to identify common mental disorders in the perinatal period: A systematic review of systematic reviews. J Affect Disord 2022;298(Pt A):634–43.
20. Buysse DJ, Reynolds 3rd CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry Res 1989;28 (2):193–213.
21. Bei B, Milgrom J, Ericksen J, Trinder J. Subjective perception of sleep, but not its objective quality, is associated with immediate postpartum mood disturbances in healthy women. Sleep 2010;33(4):531–8.
22. Dørheim SK, Bondevik GT, Eberhard-Gran M, Bjorvatn B. Sleep and depression in postpartum women: a population-based study. Sleep 2009;32(7):847–55.
23. Tomfohr LM, Buliga E, Letourneau NL, Campbell TS, Giesbrecht GF. Trajectories of Sleep Quality and Associations with mood during the perinatal period. Sleep 2015;38(8):1237–45.
24. Barr RG, Kramer MS, Boisjoly C, McVey-White L, Pless IB. Parental diary of infant cry and fuss behaviour. Arch Dis Child 1988;63 (4):380–7.
25. St James-Roberts I, Hurry J, Bowyer J. Objective confirmation of crying durations in infants referred for excessive crying. Arch Dis Child 1993;68(1):82–4.
26. Miller AR, Barr RG, Eaton WO. Crying and motor behavior of six-week-old infants and postpartum maternal mood. Pediatrics 1993;92(4):551–8.
27. Hiscock H, Cook F, Bayer J, et al. Preventing early infant sleep and crying problems and postnatal depression: a randomized trial. Pediatrics 2014;133(2):e346–54.
28. Le HN, Perry DF, Stuart EA. Randomized controlled trial of a preventive intervention for perinatal depression in high-risk Latinas. J Consult Clin Psychol 2011;79(2):135–41.
29. Zlotnick C, Tzilos G, Miller I, Seifer R, Stout R. Randomized controlled trial to prevent postpartum depression in mothers on public assistance. J Affective Disord 2016;189:263–8.
30. Lara MA, Navarro C, Navarrete L. Outcome results of a psycho-educational intervention in pregnancy to prevent PPD: a randomized control trial. J Affect Disord 2010;122(1-2):109–17.
31. Stamp GE, Williams AS, Crowther CA. Evaluation of antenatal and postnatal support to overcome postnatal depression: a randomized, controlled trial. Birth 1995;22(3):138–43.
32. Wilson CA. Perinatal mental health during the COVID-19 pandemic. Prog Neurol Psychiatry 2022;26(3):4–6.
33. Barr RG, Rivara FP, Barr M, et al. Effectiveness of educational materials designed to change knowledge and behaviors regarding crying and shaken-baby syndrome in mothers of newborns: a randomized, controlled trial. Pediatrics 2009;123(3):972–80.

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