



Engagement in and Benefits of a Short-Term, Brief Psychotherapy Intervention for PTSD During Pregnancy

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Trauma-related symptoms and post-traumatic stress disorder (PTSD) are common during pregnancy and have adverse effects on pregnancy and birth outcomes, post-partum maternal mental health, and child development. The arousal symptoms associated with PTSD, including heightened or dysregulated physiology, may contribute to these adverse outcomes. Low-income minoritized women may be at highest risk given more lifetime exposure to trauma and limited access to mental health care. While evidence-based psychotherapies for PTSD exist, none are targeted to non-treatment seeking individuals nor specifically integrated with prenatal care. Thus, we developed and tested the efficacy of a short-term (four sessions) brief (30–45 min) psychotherapeutic intervention designed to address PTSD symptoms in pregnant women receiving prenatal care at two urban medical centers. Participants were 32 pregnant women with an average gestational age of 18.5 weeks at the time of enrollment. The sample was overwhelmingly non-Caucasian, single, and reported very low income. Participants completed measures of trauma-related symptoms (Post-traumatic Stress Disorder Checklist, PCL), and depression (Edinburgh post-natal Depression Scale, EPDS) at baseline, twice during treatment, post-treatment, and at 10–14 weeks post-partum. The intervention was successful at significantly decreasing symptoms of PTSD (PCL score = -20.27 , 95% CI: -25.62 , -14.92 , $P < 0.001$, $W = -7.43$) and depression (EPDS score = -4.81 , 95% CI: -7.55 , -2.06 , $P = 0.001$, $W = -3.23$) by the final session. These benefits were sustained at post-treatment and post-partum follow ups. Future research should further explore the effectiveness of this treatment in a randomized controlled trial.

Keywords: perinatal mental health, PTSD—post-traumatic stress disorder, brief interventions, women's health, ACE

INTRODUCTION

Post-traumatic stress disorder (PTSD) is a prevalent public health concern accounting for significant disability (1). In nationally representative samples of non-pregnant individuals, lifetime prevalence rates of PTSD are estimated to be 6.4% (2) and those of partial PTSD (pPTSD; describing a subthreshold version of the disorder, where only some criteria are met, but functional impairment is still evident) (3–5) range from 4 to 11% (6, 7). PTSD rates are even higher for Black people; non-pregnant Black individuals living in violent communities report rates between 30 and 50% (8) and Black pregnant women with a history of trauma exposure report rates of 34–40% (9–12). The prevalence of pPTSD during pregnancy is estimated to be even higher, with 28.6% of women with previous pregnancy complications reporting pPTSD in a subsequent pregnancy (13). Low-income women of color may be especially at-risk for PTSD during pregnancy and less likely than white women to seek or receive treatment (9, 14).

During pregnancy, PTSD is specifically associated with increased risk for both maternal and child morbidity (15) and other adverse outcomes including ectopic pregnancy, (16) spontaneous abortion, (16) and spontaneous preterm birth (17).

Anxiety and stress during pregnancy are associated with poor pregnancy and birth outcomes, including lower birth weights (18–20) and pre-eclampsia, (21) while active PTSD during pregnancy confers a two-fold risk of preterm delivery (22). *In utero* exposure to maternal psychological distress and anxiety are also related to long-term adverse behavioral sequelae in children, including higher levels of newborn irritability, (23, 24) behavioral dysregulation in preschoolers, (25) and altered hypothalamic pituitary adrenal (HPA) axis function (as measured by cortisol awakening response) among post-adolescent teens (26). In addition to the intergenerational effects of PTSD during pregnancy, (27) low-income minority women with PTSD symptoms during pregnancy are more likely to engage in poor health behaviors, illicit drug and alcohol use, and to have thoughts of self-harm (28). Finally, women with greater lifetime trauma exposure have higher rates of tobacco use during pregnancy, (29) higher rates of premature rupture of membranes, and longer maternal hospital stays (30).

The physiologic underpinnings of PTSD, specifically heightened or dysregulated arousal, may contribute to these adverse pregnancy and birth outcomes. Arousal symptoms are one of the hallmarks of PTSD, with an exaggerated startle response often purported to be one of the cardinal symptoms of the disorder (31). Patients with PTSD have physiological alterations in stress regulation systems, including dysregulation of the HPA axis, which regulates the body's response to threat (32) and can influence the timing of parturition *via* changes in ACTH, cortisol, and CRH (33). Given the high likelihood of the arousal associated with PTSD and pPTSD contributing to adverse pregnancy, birth, and longer-term outcomes, it is therefore critical to investigate methods of delivering high quality evidence-based psychotherapy to trauma-exposed pregnant women.

Existing evidence-based psychotherapies are often recommended for individuals suffering from PTSD (34). However, non-treatment seeking patients suffering from PTSD during pregnancy may not find the recommended gold-standards in evidence-based treatments for PTSD to be acceptable or realistic, especially since these can entail up to 16 sessions of Prolonged Exposure Therapy or Cognitive Processing Therapy lasting 60–90 min each. Similar observations have been made in non-pregnant samples, which has resulted in more efforts to integrate mental health care in general into primary care settings (35). While the focus has traditionally been on treating depression and anxiety in primary care settings, (36) PTSD treatment in these settings is gaining traction (37). Recently, prolonged exposure for primary care (PE-PC), a four 30-min session treatment, has been piloted in both military and civilian samples and shown to be effective at reducing PTSD, depression, and related mental health symptoms (38, 39). Similarly, a small recent study of a four-session narrative exposure based treatment for prenatal PTSD suggested acceptability to patients and clinically meaningful change on PTSD symptoms (40). These findings suggest that short term and brief treatments may be warranted in order to be acceptable to non-treatment seeking individuals, or those experiencing less severe symptoms. In addition, the evidence base for specifically treating pPTSD, including during pregnancy, is only now in development (40). Brief and shorter-term treatments for PTSD and pPTSD focused on arousal symptoms may be especially important in pregnant populations given the potential for adverse pregnancy outcomes due to untreated illness, and concerns for intergenerational transmission of trauma (27, 41). Despite the established link between prenatal PTSD and complications of pregnancy, childbirth, and long term sequelae for mothers and children, several recent reviews suggests that research on the diagnosis and treatment of prenatal PTSD and other trauma-related disorders is extremely limited (40, 42).

To address this need, we developed and applied a novel short-term and brief psychotherapy intervention focused on psychoeducation about PTSD and pPTSD symptoms, behavior activation as a proxy for behavioral exposure, and mindfulness to address arousal symptoms to non-treatment seeking pregnant women attending a Medicaid-serving prenatal care clinic. Based on clinical records and a survey of women receiving prenatal care in our clinic, (43) we noted that women attend an average of four psychotherapy sessions when it is offered in a co-located setting. Thus, we designed our intervention to be delivered in four sessions.

Finally, given that prior life stress and trauma could influence engagement and attendance among non-treatment seeking women, (44, 45) we also aimed to determine how much prior life stress may have contributed to willingness to engage in this treatment. As few studies examine post-partum mental health outcomes beyond 6 weeks post-partum, (46) we investigated the efficacy of our intervention on both short- and longer-term mental health outcomes both during pregnancy and 10–14 weeks post-partum.

METHODS

Subject Recruitment and Screening

All recruitment took place within hospital based prenatal care clinics in the Penn Medicine Health Care System (University of Pennsylvania) and the Barnes Jewish Hospital System affiliated with the Washington University in St. Louis School of Medicine between July 2014 and September 2019. Consecutive pregnant women between 12⁰ and 22⁶ weeks gestation were screened for eligibility for the parent study and invited to participate in the treatment study if they met criteria for PTSD or pPTSD. This window in the second trimester was chosen for enrollment to allow for a pregnancy to be established, to limit the risk of enrolling women very early in gestation who may miscarry, and to allow for sufficient time during gestation to schedule and attend the six visits required during the pregnancy. Inclusion criteria required participants to be between ages 18–39, able to speak and read English at a 6th grade level, currently pregnant (up to 22⁶ weeks gestation), and meet DSM-IV-TR diagnostic criteria for PTSD or pPTSD. For the purposes of this study, pPTSD was defined as meeting symptom criteria for clusters A (trauma), B (re-experiencing), and C (avoidance) or A, B, and D (arousal) (47). Because our focus was on arousal symptoms, if patients met criteria for pPTSD with symptoms from A, B, and C, we required that they also had at least one arousal symptom from cluster D. All participants were without serious medical condition, known fetal anomaly, use of psychotropic medication or substances of abuse for at least 6 months, or lifetime history of a psychotic disorder. This study was approved by the Institutional Review Boards of both the University of Pennsylvania and the Washington University in St. Louis.

Assessment Overview

After providing written informed consent, all participants were administered the Structured Clinical Interview for Diagnosis (SCID) DSM-IV, The Perceived Stress Scale (PSS), the Edinburgh Post-natal Depression Scale, (EPDS), the Post-traumatic Stress Disorder Checklist (PCL-IV), the Adverse Childhood Experiences Questionnaire (ACE), and the TLEQ (Traumatic Life Experiences Questionnaire). Those who met study criteria for PTSD or pPTSD were invited to take part in the brief psychotherapy intervention.

Perceived Stress Scale

The PSS assesses how unpredictable, uncontrollable, overloaded, and stressful they perceive their life to be (48). On 10 questions related to perceived stress, participants indicated how often they felt or thought a certain way over the last month (0 = never, 1 = almost never, 2 = sometimes, 3 = fairly often, 4 = very often). PSS scores were calculated by summing all items.

Edinburgh Post-natal Depression Scale

The EPDS assesses depressive symptomatology over the past week (49). Although the scale was originally developed to measure depressive symptoms in post-partum women, it has been validated for use in antepartum women as well (50, 51). On 10 items measuring depressive symptoms, participants indicated how often they felt or thought a certain way, e.g., “I have been sad

or miserable” on a scale from 0 to 3, with higher scores indicating greater frequency of depressive symptoms. EPDS scores were calculated by summing all items.

Post-traumatic Stress Disorder Checklist-DSM IV

The PCL-4 is a standardized self-report rating scale for PTSD that comprises 17 items that correspond to the DSM-IV-TR version of PTSD symptoms (52). For the purposes of this study we used the civilian version of the PCL which can be applied to any traumatic event. Respondents indicate how much they have been bothered by a particular symptom over the past month using a 5-point scale ranging from 1 Not at all to 5 Extremely.

Adverse Childhood Experiences Questionnaire

The ACE-Q assesses 10 types of adversity experienced before age 18: abuse (emotional, physical, and sexual), neglect (emotional and physical), and household dysfunction (parental separation or divorce, household domestic violence, household substance abuse, parental mental illness, member of household imprisoned) (53). Each exposure was counted as one point. ACE scores were computed by summing up all exposures (0–10).

Traumatic Life Events Questionnaire

The TLEQ assesses whether an individual has been exposed to events which are conceptualized in the DSM-IV as being sufficiently aversive to result in a feeling of helplessness, horror or fear and thus qualify as a trauma (54). The TLEQ measures exposure to 23 such events. Items are summed for a total exposure count.

Intervention Procedure

Traditionally, primary care-mental health treatments (for depression) are brief and problem-focused, compared to specialized psychological interventions in which longer session durations and frequency are the norm (55, 56). This is an important consideration for pregnant women who are operating on a deadline of the pending birth and for whom symptom resolution may be important for pregnancy, birth, and long-term health outcomes.

The newly developed psychotherapeutic intervention used in this study, consisted of four 30–40 min sessions targeted at psychoeducation, cognitive restructuring, behavior activation, and mindfulness. Our brief psychotherapy builds upon a treatment devised for delivery in primary care settings and is meant to be convenient for patients and cost effective for practitioners. It uses components from cognitive behavior therapy (CBT), (57) and Mindfulness Based Stress Reduction (MBSR) (58). Sessions were delivered weekly and the research team allowed participants to make up missed sessions at any point prior to delivery.

Session 1 focuses on gathering information about the patient's symptoms, developing rapport, and providing education about PTSD symptoms. Discussing common symptoms and typical reactions to trauma can assist the patient in recognizing how these symptoms may be disruptive to her functioning. Helping patients develop a deeper understanding of their symptoms can normalize the symptoms, which leads to relief for some

TABLE 1 | Baseline demographic characteristics for all participants and by attendance.

| Variable | Overall (N = 32) | Missing 1+ intervention session (N = 19) | Completed all 4 sessions (N = 13) | P-value |
|--------------------------------|------------------|--|-----------------------------------|---------|
| Age m (SD) | 26.0 (5.2) | 26.5 (5.4) | 25.2 (5.1) | 0.524 |
| Race | | | | |
| Black/African American | 25 (78.1%) | 16 (84.2%) | 9 (69.2%) | 0.564 |
| Caucasian | 4 (12.5%) | 2 (10.5%) | 2 (15.4%) | |
| Other | 3 (9.4%) | 1 (5.3%) | 2 (15.4%) | |
| Number of lifetime pregnancies | 2.9 (1.5) | 3.2 (1.8) | 2.6 (1.0) | 0.274 |
| Number of children | 1.1 (1.3) | 1.3 (1.6) | 0.8 (0.7) | 0.195 |
| Marital status | | | | |
| Single/separated | 27 (84.4%) | 16 (84.2%) | 11 (84.6%) | 1 |
| Married/domestic partner | 5 (15.6%) | 3 (15.8%) | 2 (15.4%) | |
| Income | | | | |
| \$25 + K | 4 (12.5%) | 1 (5.3%) | 3 (23.1%) | 0.279 |
| \$25K or less | 28 (87.5%) | 18 (94.7%) | 10 (76.9%) | |
| Education | | | | |
| High school graduate or less | 17 (53.1%) | 12 (63.2%) | 5 (38.5%) | 0.280 |
| Associate/some college or more | 15 (46.9%) | 7 (36.8%) | 8 (61.5%) | |
| Baseline PCL score | 56.4 (8.8) | 56.0 (7.9) | 57.0 (10.3) | 0.770 |
| Baseline EPDS score | 13.3 (5.2) | 13.3 (5.2) | 13.3 (5.2) | 0.225 |

individuals (59). Increasing knowledge about mental illness can be seen as an intervention in itself, which is consistent with the transtheoretical model of behavior change (i.e., being aware of the current stage of change) (60, 61).

Session 2 focuses on behavior activation, which can help the patient identify triggers and subsequent avoidance behaviors. The therapist assists the patient in overcoming avoidance of certain situations and together with the patient identifies pleasurable activities based on their values, and encourages the patient to schedule and engage in these activities. Additionally, the patient may also identify specific thoughts and feelings that are related to the traumatic events that are facilitating either cognitive or behavioral avoidance. Participants are encouraged to set goals that are consistent with their values and work toward accomplishing these goals (i.e., taking their children to the zoo; driving alone at night, etc.). Behavior activation is an important step in this treatment because it acts as a proxy for exposure in helping a patient to overcome avoidance behaviors. It has also been shown to be an effective treatment for depression, which is often comorbid with PTSD symptoms (62). Avoidance of pleasurable activities may also maintain symptoms by preventing the reinforcement of the patient's natural environment.

Session 3 introduces the idea and practice of mindfulness, which is targeted to address the arousal symptoms that are the hallmark of trauma-related mental health symptoms. Awareness and acceptance of trauma-related thoughts and feelings may serve as an indirect mechanism of cognitive-affective exposure. This may be especially useful for individuals with trauma-related symptoms as it may help reduce arousal, and foster emotion regulation. Regular mindfulness practice has been shown to decrease physiological arousal (63). Finally, *Session 4* reviews mindfulness concepts and practice as well as focuses on future goals that the patient would like to accomplish. Relapse

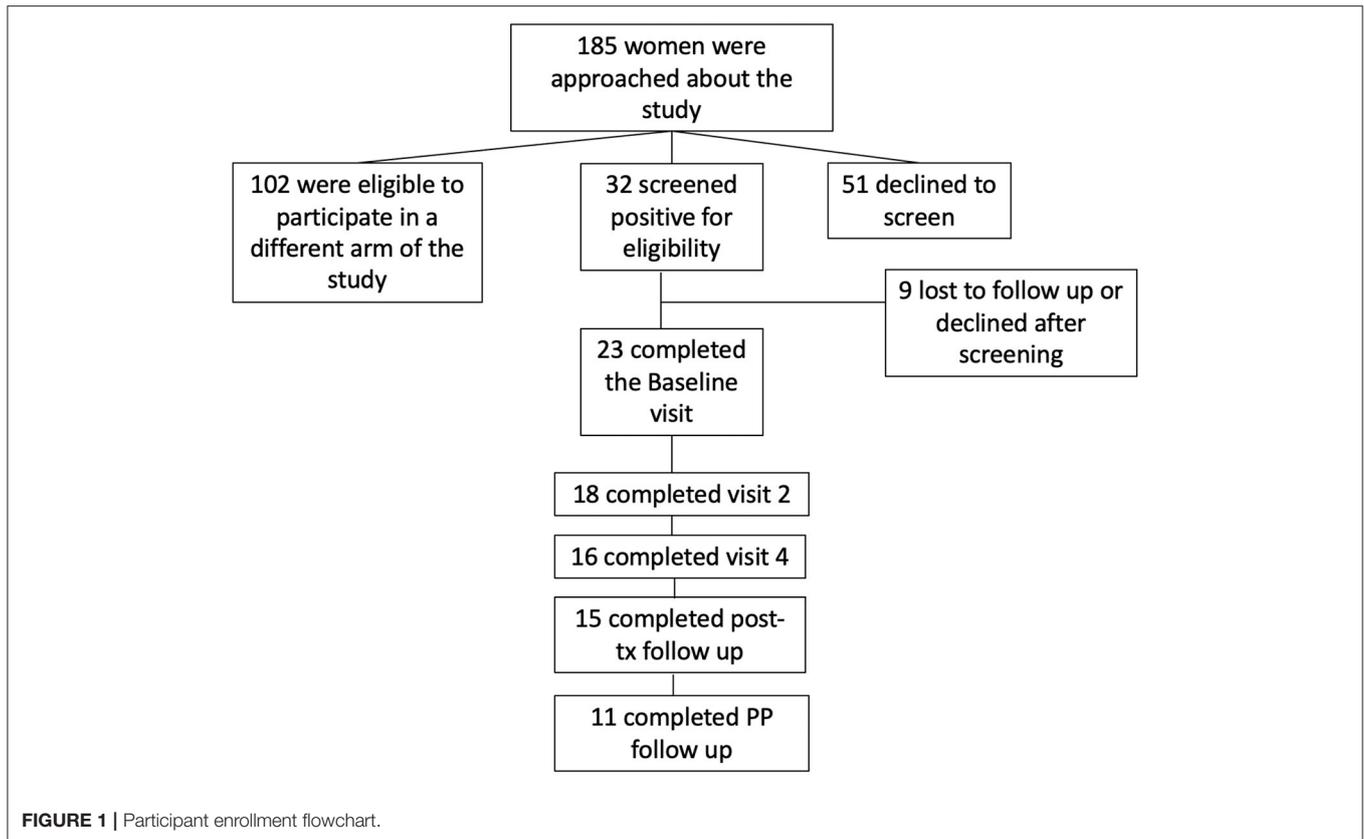
prevention is also discussed in this session as a way to help the patient identify symptoms that would necessitate a return to treatment in the future.

Statistical Analysis Plan

Demographic data was summarized for $N = 32$ women who had screening and/or baseline PCL data with means and standard deviations for continuous variables and frequencies and percentages for categorical variables. Demographic variables were compared (i) between sites, (ii) between those who completed at least one intervention session compared to none, (iii) between those missing one or more intervention session with those who completed all intervention sessions, and (iv) between those missing their 10–14 week follow-up and those who completed their 10–14 week follow-up; differences were tested with two-sample *t*-tests or Fisher's exact tests, as appropriate. There were no significant differences in demographics for any of these comparisons, so models did not account for site and missing longitudinal data was assumed to be missing completely at random.

Continuous longitudinal assessment variables (i.e., EPDS, PSS, and PCL) were modeled as repeated measures outcomes using generalized estimating equations models (GEEs) with exchangeable correlation structures; binary outcomes (e.g., EPDS >10) were modeled in this framework with a logit link. Adjusted models included number of completed treatment visits. Gestational age at baseline was considered as a covariate but as it did not have any significant effect on the significance or direction of any of the adjusted results it was not ultimately included in the models.

When arousal symptoms were analyzed, a PCL item score of ≥ 3 was used to determine whether an item was endorsed. DSM-IV-TR criteria for meeting the arousal cluster require



endorsement of 2 out of 5 items. Severity was calculated by summing the scores of the five arousal items. Total number of ACEs experienced and total TLEQ score were considered as important predictors of these longitudinal psychological outcomes, and it was hypothesized that they would predict engagement in the study treatment (44, 45). First, each of these were tested with one-way ANOVAs or two-sample *t*-tests, as appropriate, to determine if they were significant predictors of number of visits completed or completing the intervention. Then, each of these continuous variables was added as a predictor in the GEE models to determine if they had significant effects on mean levels of outcomes over time. To determine if total ACE or total TLEQ had an effect on outcomes over time, an interaction was tested in each model between each of these predictors with time.

Data were analyzed with an intent-to-treat analysis; participant data was included even if all study visits or measures were not completed. Adjusted models accounted for number of completed visits. A significance level of $\alpha = 0.05$ was used for all tests, and effect sizes are reported with Wald statistics (*W*) from robust standard errors in GEE models, *F* statistics for ANOVAs, and *t* statistics for two-sample *t*-tests. Statistical analyses were conducted in R version 4.0.5 (64).

Participants

Demographic information is presented in **Table 1**. The sample was comprised of 32 pregnant women with an average gestational age of 18.5 weeks at the time of enrollment. The sample was

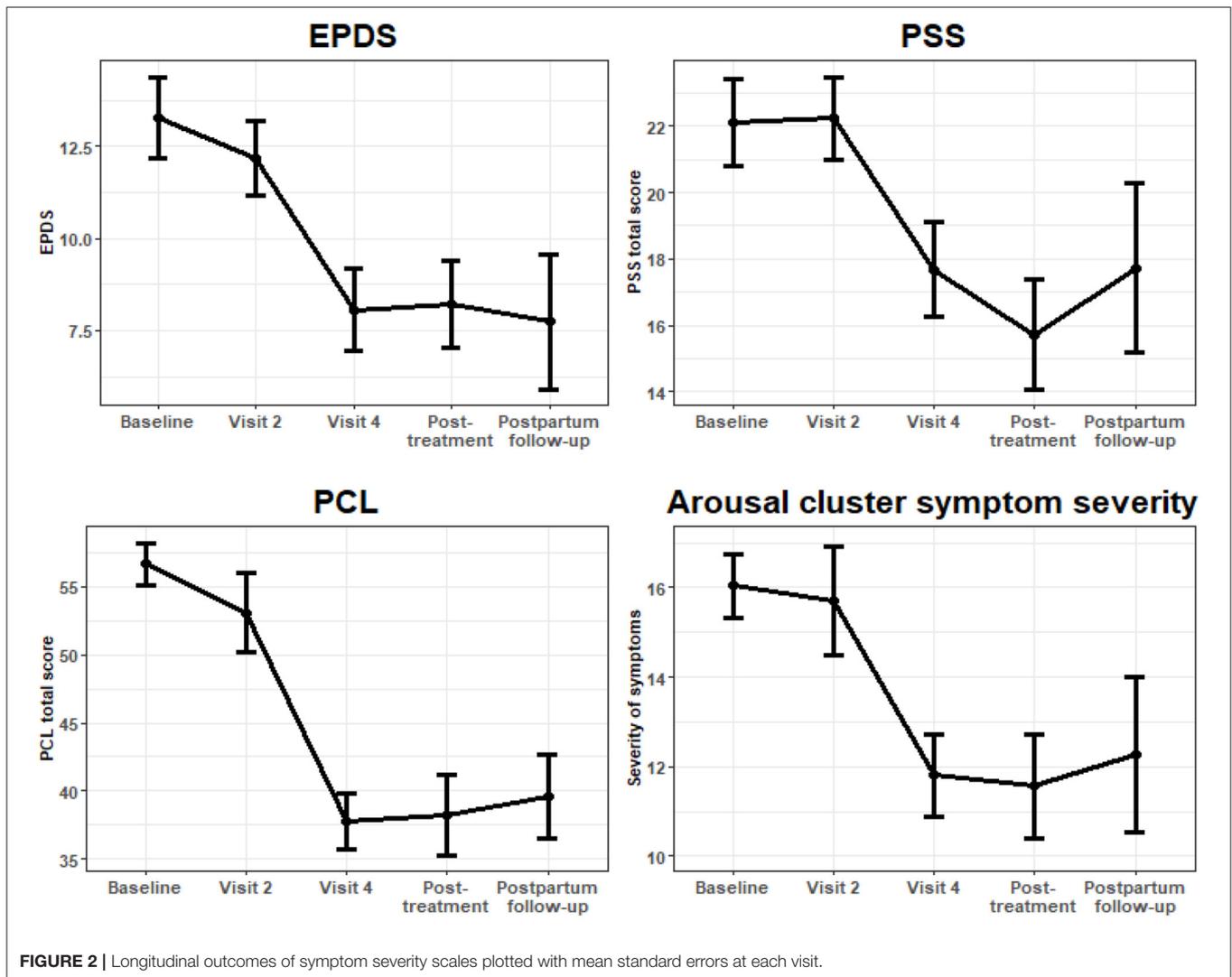
overwhelmingly non-Caucasian, single, and reported very low income (under \$25,000).

One hundred eighty five (185) women were approached about the study, 32 screened positive for eligibility and consented to participate, and 23 completed the baseline visit. Of those 23, 18 completed measures at visit 2; 16 at visit 4, 15 at post-treatment follow-up, and 11 at the final follow-up, 10–14 weeks post-partum. See **Figure 1**. We collected delivery data on 25 participants. Adjusted models described below account for the number of completed treatment visits. There were no significant differences in demographics between women who enrolled and then failed to follow-up or dropped out after the Baseline visit (data not shown).

RESULTS

PTSD

At baseline, mean PCL-C score was 56.4 (SD 8.9). At the final session of the intervention (visit 4), PCL had decreased an average of 20.27 points (95% CI: $-25.62, -14.92, P < 0.001, W = -7.43$) after adjusting for number of completed treatment visits. This effect remained at both follow-up time points; with PCL-C score remaining significantly lower than at baseline at the post-treatment follow-up ($-19.81, 95\% \text{ CI: } -25.30, 14.32, P < 0.001, W = -7.08$) and at post-partum follow-up at 10–14 weeks post-partum ($-19.56, 95\% \text{ CI: } -25.30, -14.32, P < 0.001, W = -6.85$). See **Figure 2**.



Given our specific interest in the relationship of arousal in PTSD to adverse pregnancy outcomes, (22) we investigated change in the number of arousal symptoms reported. Using number of arousal symptoms endorsed as a continuous variable, at the baseline visit, the mean (SD) number of arousal symptoms endorsed was 3.3 (1.4). By the final intervention session (visit 4), the number of arousal symptoms was on average 1.55 points lower (95% CI: $-2.35, -0.75$, $P < 0.001$, $W = -3.80$), and this effect remained significant at the post-treatment follow-up visit (-1.83 ; 95% CI: $-2.72, -0.94$, $P < 0.001$, $W = -4.03$), as well as at the post-partum follow-up visit (-1.90 , 95% CI: $-2.82, -0.98$, $P < 0.001$, $W = -4.05$).

Similarly, when we investigated the change in severity of the arousal symptoms, we found significant and sustained decreases in arousal symptom severity at visit 4 (-5.04 ; 95% CI: $-7.06, -3.02$, $P < 0.001$, $W = 4.90$), post-treatment (-5.45 ; 95% CI: $-7.75, -3.14$, $P < 0.001$, $W = -4.63$), and post-partum follow-ups (-5.05 , 95% CI: $-8.32, -1.77$, $W = 3.02$). For these analyses, severity of arousal symptoms was determined by the

sum of scores on PCL-IV items corresponding to cluster D (items 13–17).

Lastly, we investigated changes in whether criteria were met for the arousal symptoms cluster of the PTSD diagnosis; 2 out of 5 arousal cluster symptoms. Compared to baseline, at visit 4 there was a significant decrease in the likelihood of meeting criteria for the arousal symptom cluster (D) (aOR = 0.16, 95% CI: 0.04, 0.69, $P = 0.014$, $W = -2.32$), and this change was sustained at both follow-up time points (post-treatment follow-up: aOR = 0.12, 95% CI: 0.02, 0.59, $P = 0.009$, $W = -2.57$; post-partum follow-up: aOR = 0.05, 95% CI: 0.01, 0.37, $P = 0.003$, $W = -2.95$).

Depression

At baseline, mean EPDS score was 13.3 ($SD = 5.2$). Over the course of the intervention and follow-up period, there were significant sustained decreases in depression score, as measured by the EPDS. By visit 4, the adjusted mean difference in EPDS score compared to baseline was -4.81 (95% CI: $-7.55, -2.06$,

$P = 0.001$, $W = -3.23$), and results remained consistent at the post-treatment follow-up (-4.54 , 95% CI: -7.29 , -1.79 , $P = 0.001$, $W = -3.10$) and post-partum follow-up (-5.46 , 95% CI: -9.15 , -1.77 , $P = 0.004$, $W = -2.81$). See **Figure 1**. Similar results were found when modeling EPDS as a binary outcome (EPDS >10; EPDS >13). After adjustment, there were significantly lower odds of having an EPDS >10 at visit 4 ($P = 0.003$, $W = -2.77$), post-treatment ($P = 0.040$, $W = -2.07$) and post-partum follow-up ($P = 0.013$, $W = -2.47$), as well as significantly lower odds of having an EPDS score >13 at these visits ($P = 0.017$, $W = -2.29$; $P = 0.006$, $W = -2.80$; $P = 0.033$, $W = -2.17$, respectively).

Number of Sessions Required for Improvement

We examined change in score for the PCL, EPDS, PSS, and number of arousal symptoms at each treatment session to determine whether there was a treatment effect by session. For all measures except the PCL, treatment effects did not become evident until session 4. For PCL scores, improvement was seen beginning at session 2 in both unadjusted models and those models that adjusted for the number of completed treatment visits (PCL Visit 2, adjusted estimate = -5.18 95% CI: -9.85 , -0.52 , $P = 0.029$; $W = -2.34$).

Lifetime Stress Effects

Neither ACE nor TLEQ scores had a significant impact on treatment engagement, as measured by number of completed visits (ACE, $P = 0.446$, $F = 0.61$; TLEQ, $P = 0.094$, $F = 3.00$; See **Tables 2, 3**). Similarly, neither ACE nor TLEQ scores were related to treatment dropout after session 1, comparing those completing 0–3 sessions to those completing all four sessions (ACE, $P =$

0.883 , $t = 0.15$, $df = 14.48$; TLEQ, $P = 0.059$, $t = -1.98$, $df = 24.23$).

Finally, we tested separate interactions between both ACE and TLEQ and time to determine whether an individual's ACE or TLEQ score affected the trajectory of improvement longitudinally over the four follow-up periods for depression, perceived stress, and PTSD symptoms. Our findings indicate a relationship between TLEQ and EPDS, analyzed continuously, (unadjusted and adjusted models, $P < 0.001$; global Z-test for interaction 4.35, 4.44) such that higher TLEQ scores were associated with increases in depression symptoms from pregnancy to post-partum.

Similarly, ACE scores significantly affected EPDS trajectory over time in both unadjusted ($P = 0.002$) and adjusted ($P = 0.003$) models; with an association showing higher ACE scores were associated with more depressive symptoms in both the unadjusted ($P = 0.002$, $Z = 3.44$) and adjusted ($P = 0.003$, $Z = 3.40$) models. However, this latter result should be interpreted with caution since the range of ACE scores was truncated at the post-partum follow-up timepoint (range, 2–6), post-partum $N = 11$, limiting the generalizability of this result.

DISCUSSION

In a novel study testing the efficacy of a brief treatment for clinically meaningful PTSD in a sample of non-treatment seeking, majority Black pregnant women we found that PTSD symptoms, depression, and stress all significantly decreased in response to the intervention. Strikingly, these benefits persisted into the post-partum period and were sustained at 10–14 weeks after birth. The intervention was designed to address the specific detrimental effects of psychophysiological arousal that is characteristic of full PTSD or pPTSD, and our findings suggest that this was successful. The total number and severity of arousal symptoms, and the proportion of participants meeting criteria for the arousal cluster diagnosis in DSM-IV-TR were all significantly reduced.

Psychotherapeutic treatment for PTSD has been established as a safe option for pregnant individuals, (65, 66) despite commonly held beliefs that discussing trauma may be stressful and thus detrimental to an expectant mother or her child (67). However, few studies include pregnant women in research investigating psychotherapeutic treatments for PTSD, (68, 69) and even fewer specifically target perinatal PTSD or pPTSD (42, 66).

This gap in the literature represents a major oversight given the risks of untreated PTSD in pregnancy, the potential risk that it poses for offspring, and given that the prevalence of PTSD in pregnancy approaches or surpasses the prevalence rates of other major pregnancy complications that are associated with significant morbidity and mortality (70). The findings of this treatment study indicate that even a brief and short-term psychotherapeutic intervention can have clinically meaningful benefits for pregnant patients. That these effects persist into the post-partum period has implications for the benefits of trauma-focused therapy on post-partum maternal and family

TABLE 2 | Total ACE and number of treatment sessions attended.

| Number follow-up visits | N | Mean (SD) total ACE | P value |
|-------------------------|----|---------------------|---------|
| 0 | 2 | 6.50 (3.54) | 0.446 |
| 1 | 2 | 3.50 (2.12) | |
| 2 | 3 | 4.33 (2.08) | |
| 3 | 2 | 3.50 (2.12) | |
| 4 | 13 | 4.31 (1.80) | |

Differences tested with one-way ANOVAs or two-sample t-tests, as appropriate.

TABLE 3 | Total TLEQ and number of treatment sessions attended.

| Number follow-up visits | N | Mean (SD) total TLEQ | P value |
|-------------------------|----|----------------------|---------|
| 0 | 11 | 6.91 (3.30) | 0.094 |
| 1 | 2 | 7.50 (0.71) | |
| 2 | 2 | 7.00 (1.41) | |
| 3 | 2 | 6.50 (4.95) | |
| 4 | 13 | 9.23 (3.30) | |

Differences tested with one-way ANOVAs or two-sample t-tests, as appropriate.

functioning and the potential for improved longitudinal child outcomes (71–74).

Prenatal interventions for PTSD have largely been neglected in favor of screening and treatment efforts for post-partum depression (42, 66). Perinatal PTSD is undetected and untreated in the vast majority of women, (10, 75) and pPTSD may be even more overlooked. However, the neglect of PTSD during pregnancy may be short sighted given the frequency of comorbid diagnoses of PTSD and depression. For example, based on recent studies among trauma-exposed perinatal women, as many as 65–85% of those with depression also have PTSD (76) or pPTSD (77). This comorbidity suggests that a focus on depression risk alone is too narrow. The treatment tested in this study indicated benefit for both symptoms of PTSD as well as depression, suggesting that it may be possible to combine treatment efforts in short-term psychotherapies and generate lasting benefit for perinatal women.

Our investigation to determine the minimum number of treatment sessions necessary to see symptom improvement suggested that depression and perceived stress required a complete course of treatment, while for PTSD symptoms, benefits were realized by session 2. These findings are perhaps unsurprising since the treatment was designed to address PTSD symptoms first and psychoeducation about trauma, maintaining features, and treatment planning are addressed in session 1. Session 2 focused on behavior activation and set a plan for participants to enact their behavior activation goals prior to the next session, and session 3 focused on an introduction to mindfulness. As it is well-established that behavior activation (78) and mindfulness-based interventions (79) are effective treatments for depression (80), it is not surprising to see improvement in depression symptoms after these topics are addressed in the study treatment.

Psychiatric treatment initiation and follow-up during pregnancy is known to be challenging, with high rates of drop-out (45). This effect may be even more heightened in treatment for PTSD as concerns have been noted about the tolerability of exposure therapies, (81, 82) despite empirical evidence suggesting that exposure therapy for PTSD is not associated with greater risk for treatment drop-out (83). We nonetheless explored attrition based on prior experience of trauma. Consistent with prior literature, we found that neither ACE nor TLEQ scores conferred additional risk of failure to initiate treatment, and neither were associated with failure to complete the four-session course of psychotherapy. This finding is especially noteworthy since our sample was non-treatment seeking women, who were recruited, screened and offered psychotherapy in the course of their standard prenatal care. Our results highlight the urgent need for effective psychotherapies to address prenatal PTSD or pPTSD.

Our study included majority low-income, low-resourced patients with mental health concerns, who have been shown to be less likely to obtain mental health care in the traditional setting (84). Despite the significant impairment (3) and chronicity (85) associated with both PTSD and pPTSD, a significant number of individuals and especially minoritized individuals with these disorders never seek or receive any treatment for their symptoms

(86). Prior literature suggests that the major barrier to seeking treatment is access and knowledge about where to seek treatment, (86) which may have also been the case amongst the women enrolled in this study. Given that the majority who initiated treatment completed all four sessions, our results suggest four sessions of psychotherapy is acceptable and feasible for non-treatment seeking pregnant women. As we did not collect data specifically on acceptability and feasibility, this inference should be interpreted with caution. Our study offered the intervention either in the prenatal care clinic or in outpatient offices of psychologists located several blocks away; therefore future research should explore acceptability of treatment offered in different settings that are convenient for the patient, including home-based treatments offered online (87–89).

This study is not without limitations. Our sample size is small, without a control group, and limited to a cohort of women who are demographically homogenous. However, given high levels of trauma and poor access to mental health services in low-income, majority Black communities (8, 9, 90) the findings may be generalizable to pregnant women in other similar communities outside of Philadelphia and St. Louis (9). Given the small sample size, we were unable to investigate the relationship between improvement in PTSD and pPTSD symptoms and preterm birth or other pregnancy or birth outcomes. We are also limited by the reliance on a self-report measure based on prior diagnostic criteria for PTSD (91). However, a recent study (92) suggests substantial agreement between the PCL-C used in this study and newer version of the PCL developed for use with DSM-5 (93). With pilot data that supports our hypotheses that our treatment can improve symptoms in a lasting way, future studies should aim to offer these clinical services to more women to reach stronger conclusions about effects of mental health services offered during pregnancy to positively impact pregnancy and birth outcomes.

CONCLUSIONS

Our findings highlight the benefit of a course of brief, short-term psychotherapy designed to alleviate symptoms of PTSD or pPTSD in a cohort of non-treatment-seeking, mostly Black low-income pregnant women. Given the high prevalence of PTSD or pPTSD among trauma-exposed pregnant women, the frequency of comorbid depression, and the lack of existing acceptable treatment options for this population, our study suggests that brief treatments may be sufficient and acceptable and result in lasting change with implications for improved functioning in the post-partum period. Given the promising outcome of this brief perinatal intervention for non-treatment seeking women, future research should expand on and replicate the work in a randomized controlled trial to establish the effectiveness of the intervention and improve the generalizability of our findings. That a brief trauma-focused intervention can have such lasting benefit for women, and by extension their families, children, and communities warrants further exploration to make this approach a mainstay of perinatal care.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

This study was conducted following ethical guidelines and as such was approved by the IRBs of both the University of Pennsylvania and the Washington University in St. Louis. The patients/participants provided their written informed consent to participate in this study.

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AUTHOR CONTRIBUTIONS

SK and NE designed the study. RK organized the database. RJ and MS performed and supervised the statistical analyses. SK wrote the first draft of the manuscript. RJ, LH, NE, RW, and SK contributed to writing and editing sections of the manuscript. All authors contributed to manuscript revisions, and read and approved the submitted version.

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