



# NICU-Specific Stress Following Traumatic Childbirth and Its Relationship With Posttraumatic Stress

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## ABSTRACT

This mixed-methods pilot study investigated maternal perceived stress specific to infant neonatal intensive care unit (NICU) hospitalization as a moderator of the relationship between traumatic childbirth appraisal and symptoms of posttraumatic stress disorder (PTSD). NICU mothers ( $N = 77$ ) were recruited via social media 1 to 4 months postpartum for a cross-sectional survey about perinatal experiences. Measures included traumatic childbirth, PTSD Checklist for *DSM-5*, and Parental Stressor Scale (PSS): NICU. Quantitative results indicated that, only at high levels of stress, women who reported traumatic childbirth (68%) reported significantly higher PTSD symptoms [ $b = 18.00$ , standard error = 7.18,  $t = 2.51$ ,  $P = .015$ , 95% confidence interval (3.65, 32.36)]. Qualitative analysis identified additional stressors: maternal emotional well-being, dissatisfaction with care, infant health problems, breastfeeding, and additional characteristics of the NICU environment. Results provide supportive evidence that NICU mothers are at high risk for childbirth-related trauma and PTSD. Perceived

stress related to the NICU may be an important intervention target when developing trauma-informed patient care. In addition to the domains captured by the PSS: NICU, maternal emotional well-being, interpersonal relationships with NICU staff, and stress related to breastfeeding are additional areas for improvement in the family-centered NICU.

**Key Words:** childbirth, NICU, postpartum, PTSD, stress

Childbirth can be a traumatic experience leading to posttraumatic stress disorder (PTSD).<sup>1</sup> The American Psychiatric Association defines a traumatic experience as including a threat of death or serious injury to oneself or a loved one.<sup>2</sup> In a traumatic childbirth, the safety of the mother and/or her child is threatened by obstetric and/or neonatal medical complications.<sup>3</sup> Reported prevalence rates of traumatic childbirth have ranged greatly. Alcorn and colleagues<sup>4</sup> found that 84% of mothers reported a traumatic childbirth, while Ford et al<sup>5</sup> and Boorman and colleagues<sup>6</sup> reported that the prevalence is closer to 30%. In a recent meta-analysis, Yildiz and colleagues<sup>7</sup> reported that around 3% of women develop PTSD in the postpartum period, but assessment of traumatic childbirth is generally absent among reported data. Regardless, postpartum PTSD can have devastating effects on maternal well-being and child development.<sup>8</sup>

Newborn medical complications and resultant admission to a neonatal intensive care unit (NICU) are understood to be stressful experiences that could contribute to maternal perceptions of compromised safety.<sup>3,9</sup> About 77 in every 1000 live births in the United States result in NICU admission.<sup>10</sup> As prior research has utilized non-NICU samples or failed to specify participant rates of NICU admission, data regarding traumatic childbirth specifically for NICU mothers are unavailable.

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Further, research has generally focused on measuring severity of PTSD symptomology without assessing for a traumatic experience. However, severity of PTSD symptoms is consistently found to be higher among mothers of children hospitalized in the NICU after birth,<sup>4,7,11</sup> suggesting that NICU care may increase a mother's perception of danger during childbirth.<sup>12,13</sup>

NICU mothers face unique postpartum challenges, including physical separation from their child, the inability to consistently participate in normative parenting activities, and worry for their child's health.<sup>14</sup> With the Parental Stressor Scale: NICU (PSS: NICU), Miles et al<sup>15</sup> determined 3 domains of NICU experiences contributing to perceived stress: the infant's behavior and appearance, the sights and sounds of the unit, and alterations in the parental role. On the PSS: NICU, mothers rate the perceived severity of stress related to specific experiences encountered in the NICU (eg, "the small size of my baby" and "not feeding my baby myself"). NICU stress is generally higher in parents of children with more severe medical problems.<sup>16</sup> To our knowledge, the PSS: NICU is the only validated measure assessing parental stress specific to NICU hospitalization.

NICU stress has been longitudinally associated with more severe symptoms of postpartum depression<sup>14</sup> and more negative parenting at preschool age, independent of parental mental health.<sup>17</sup> However, there is a paucity of research focusing on relationships between NICU stress and postpartum PTSD. The little research available has yielded mixed results. While Holditch-Davis and colleagues<sup>18</sup> showed that stress specific to the child's appearance and alterations in the parental role were both positively associated with PTSD symptoms, Shaw and colleagues<sup>19</sup> found that only stress associated with the sights and sounds of the unit was significantly positively correlated with PTSD symptoms. With regard to general perceived stress (ie, not NICU specific), Lefkowitz et al<sup>20</sup> found that having more concurrent general life stressors was a positive correlate of PTSD symptom severity in NICU mothers. In contrast, Aftyka and colleagues<sup>21</sup> found no difference in perceived stress between NICU mothers who screened positive for PTSD and those who screened negative. Thus, the potential relationship between perceived stress and PTSD symptomology in this population is unclear. Importantly, Malin and colleagues<sup>22</sup> found that parental perceptions of child illness severity were predictive of PTSD symptomology even after adjusting for objective medical severity, suggesting that subjective perceptions of NICU care are important.

Relationships among traumatic childbirth, PTSD, and NICU stress can be conceptualized using a cognitive model of PTSD proposed by Ehlers and Clark.<sup>23</sup> Ap-

plying this framework, there are 3 important events we considered for NICU mothers: (1) perceived danger in childbirth, (2) NICU-specific stress, and (3) the experience of PTSD symptoms. First, a mother perceives threat to her/her infant's life during childbirth, leading to traumatic childbirth appraisal. Next, stressors encountered during the infant's NICU stay maintain the perception that a threat to the infant's life/safety is ongoing. The maintenance of this threat contributes to the development and prolongation of PTSD symptoms. Support for a cognitive model of postpartum PTSD can be found in evidence that maternal cognitive appraisals of trauma related to childbirth mediate the relationship between personal risk factors for distress (eg, maladaptive coping) and PTSD symptom severity.<sup>5</sup> Additionally, King and colleagues<sup>24</sup> showed that cognitive factors explained an additional one-third of the variance in PTSD symptoms after accounting for personal and obstetric risk factors. Importantly, this evidence was found in samples comprised of both NICU and non-NICU mothers, and differences between groups were not explored. While non-NICU mothers have opportunities to attenuate these negative trauma appraisals through repeated exposure to their healthy infant, NICU-specific stressors may complicate and slow resolution of trauma. Thus, the impact of perceived stress on PTSD symptoms may be even stronger in an intensive medical environment.

The overarching aim of the current study was to investigate relationships between NICU stress, traumatic childbirth, and PTSD. Specifically, we expected NICU stress to act as a moderator, such that women who appraised childbirth as traumatic and had high levels of NICU stress would report the most severe PTSD symptomology. As limited exploration of NICU-specific stress exists, we further aimed to identify additional stressors experienced by NICU mothers through qualitative analysis.

## MATERIALS AND METHODS

### Participants

Participants were recruited as part of a larger study assessing relationships among childbirth experiences (eg, obstetric complications) and maternal postpartum well-being (eg, PTSD). Inclusion criteria were being: (1) at least 18-years-old, (2) the biological mother of a living child born between 1 and 4 months prior to participation, (3) a resident of the United States, and (4) able to complete an online survey in English. Of the 257 mothers who responded to the study advertisement, 254 provided consent for participation, and 97 were NICU mothers. Five NICU mothers completed less than 75% of the study survey and 14 did not meet

eligibility criterion 2 regarding the infant's age at time of study participation. There were no differences in demographics, obstetrics, or outcomes between these 14 participants and the remainder of the NICU mothers. Data from 1 participant were removed for inconsistent responding. Thus, the final sample included data from 77 NICU mothers.

## Procedure

Mothers were recruited between November 2015 and July 2016 through advertisements for a survey study about postpartum well-being posted to social media groups. The topic of these groups varied, including those focused on connecting mothers based on timing of pregnancy (eg, Mothers of Babies Born in October 2015), general postpartum support (eg, C-section Moms), and those surviving a specific obstetric complication (eg, Postpartum Hemorrhage Survivors). Individuals self-identified as interested and eligible and completed informed consent online prior to accessing the study survey administered via Qualtrics (Provo, Utah). They were instructed to complete the survey with respect to only their most recent childbirth experience (ie, the index birth). No identifying information was collected. This study was approved by East Carolina University's Institutional Review Board.

## Measures

Participants were first asked to report demographic (eg, race, age, and marital status) and obstetric characteristics (eg, gravidity and parity). With regard to the index birth, participants reported child gestational age at birth and birth weight before completing a checklist of pregnancy and childbirth medical complications developed by Stramrood et al.<sup>25</sup> NICU mothers were also asked to report the duration of their child's NICU stay at the time of participation, if they knew prior to childbirth that their child would require NICU care, if their child was currently hospitalized in the NICU, and how frequently they visited the hospital.

### NICU stress

Level of stress associated with NICU hospitalization was measured with the PSS: NICU,<sup>14</sup> which consists of 26 items in 3 domains: the sights and sounds of the unit (PSS: NICU-SS), the baby's appearance and behavior (PSS: NICU-BAB), and parental role alteration (PSS: NICU-PRA). NICU mothers rated how stressful each experience had been on a scale of 1 (*not at all stressful*) to 5 (*extremely stressful*). Ratings were summed to obtain domain and total scores, with higher scores indicating greater perceived stress. Cronbach's  $\alpha$  was 0.92 for the full measure and between 0.76 and 0.90 for the domains.

The PSS: NICU also includes 1 open-ended item allowing participants to write about any other situations they found stressful during their child's NICU stay.

### Traumatic childbirth

Traumatic childbirth was defined in accordance with *Diagnostic and Statistical Manual of Mental Disorders*, Fifth Edition (*DSM-V*) criteria of "actual or threatened death, serious injury, or sexual violence."<sup>2(p210)</sup> Thus, traumatic childbirth appraisal was determined if participants answered "yes" to 1 or both of 2 questions: at any point during your childbirth, did you think (1) your life was in danger or you were in danger of being seriously injured, and (2) your baby's life was in danger or your baby was in danger of being seriously injured. Similar operationalization of traumatic childbirth has been utilized in published studies of postpartum trauma.<sup>26</sup>

### Childbirth-specific PTSD

The PTSD Checklist for *DSM-5* (PCL-5)<sup>27</sup> was used to assess PTSD symptomology. The PCL-5 includes 20 items that directly correspond to the diagnostic criteria for PTSD in the *DSM-5*.<sup>2</sup> Participants rated how bothered they had been by each of 20 symptoms in the prior month on a scale of 0 (*not at all*) to 4 (*extremely*), and ratings were summed for a total score. Higher scores are indicative of more severe pathology, and a clinical cut-off score of 33 was used to determine a positive PTSD screen.<sup>28</sup> Participants were instructed to respond to the PCL-5 items while considering their index childbirth. Wording of individual items was also altered slightly to change "the stressful experience" to "giving birth," for example, "Repeated disturbing dreams about *giving birth*." Cronbach's  $\alpha$  in the current study was 0.95.

### Prior trauma exposure

Lifetime trauma exposure was assessed with the Stressful Life Events Screening Questionnaire.<sup>29</sup> Participants indicated (yes/no) if they experienced 11 potentially traumatic life events prior to their index birth. They were able to write in additional traumas. Positive responses were summed for a total trauma exposure score. Prior trauma is a known risk factor for trauma appraisal and PTSD.<sup>30</sup>

## Data analysis

Descriptive statistics were calculated for all variables. As birth weight, gestational age at birth, and duration of NICU stay were strongly intercorrelated ( $r_s > 0.77$ ), only duration of NICU stay was examined further to prevent redundancy. Duration of NICU stay and time since giving birth were included as covariates to account for differences in opportunity for stress

exposure and resolution of stress/trauma over time, respectively. Independent-samples *t* tests,  $\chi^2$  analyses, and correlations were performed to identify associations between demographic and obstetric characteristics and trauma appraisal, NICU stress, and PTSD symptoms. We utilized linear regressions to investigate causal associations between trauma/PTSD symptoms and NICU stress. We conducted moderation analyses using the Process macro<sup>31</sup> for SPSS version 26, examining the effect of NICU stress (moderator, total PSS: NICU score) on the association between traumatic childbirth appraisal (predictor, dichotomous) and PTSD symptoms (criterion, total PCL-5 score). Participant characteristics that demonstrated significant relationships with the criterion were included as covariates.

Responses to the open-ended question about additional stressful NICU experiences were analyzed utilizing a thematic analysis framework. Two authors (M.S. and N.H.) with training in qualitative methods independently reviewed and identified common constructs in all participant responses. This was an iterative process, as constructs were added throughout data analysis. We then compared constructs, discussed discrepancies to achieve 100% concordance, and organized constructs into themes. The senior author (C.D.) was available as an adjudicator for discrepancies and as a general consultant throughout this process.

## RESULTS

### Participants

Participant characteristics are summarized in Table 1. The majority of participants identified as White race and were married and living with their child's father. All participants had at least a high school education, and the majority were employed at least part-time. Most were first-time mothers who gave birth preterm via C-section, and 90% of C-sections were unplanned/emergent. There was a large range in NICU length of stay (minimum: 1 day, maximum: 117 days; median length of stay = 21.50 days), with 17 participants (22.1%) reporting a stay shorter than 1 week and 32 (41.6%) reporting a stay longer than 1 month.

### Traumatic childbirth and NICU stress

Over two-thirds of participants ( $n = 52$ , 67.5%) appraised childbirth as traumatic. Traumatic childbirth was more likely for participants who were primiparous [77.8% vs 53.1%,  $\chi^2(1) = 5.18$ ,  $P = .023$ , odds ratio [OR] 3.09] or had a C-section [78.6% vs 55.9%,  $\chi^2(1) = 4.48$ ,  $P = .034$ , OR 2.89]. Infants of women who reported traumatic childbirth were hospitalized longer (mean = 34.94

**Table 1. Participant demographic and obstetric characteristics (N = 77)**

	<i>n</i> (%)
Race: White	68 (88.3)
Hispanic or Latina	7 (9.1)
Marital status: married	57 (74.0)
Living with infant's biological father	73 (94.8)
Education	
High school diploma or GED	42 (54.5)
Bachelor's degree	22 (28.6)
Graduate or professional degree	13 (16.9)
Employed part- or full-time	41 (53.2)
Primigravida	32 (41.6)
Primiparous	45 (58.4)
Multiple pregnancy	7 (9.1)
Mode of delivery: cesarean	
Low birth weight (<2500 g)	47 (61.0)
Preterm (<37 completed weeks' gestation)	43 (55.8)
Knew infant would need NICU care	35 (45.5)
Currently hospitalized in NICU	23 (29.9)
Visited/visiting NICU daily	67 (87.0)
	<b>Mean (SD)</b>
Maternal age, y	39.64 (5.78)
Duration postpartum, d	65.85 (23.66)
Gestational age at (completed) birth, wk	33.68 (5.30)
Birth weight, g	2248.42 (1244.14)
Duration of NICU stay, d	29.57 (26.79)

Abbreviations: GED, General Educational Development; NICU, neonatal intensive care unit.

days, SD = 29.10) compared with those without trauma appraisal (mean = 17.92 days, SD = 15.60),  $t(71.66) = 3.28$ ,  $P = .002$ , Hedges'  $g = 0.66$ . No other characteristics differed by traumatic childbirth. Linear regressions with simultaneous entry were performed to assess relationships between trauma appraisal and stress including relevant covariates (see Table 2). Traumatic childbirth was not a significant predictor of NICU stress while accounting for the effects of covariates.

### Traumatic childbirth and PTSD

Eighteen participants (23.4%) scored above the clinical cutoff for PTSD. PTSD symptomology was positively correlated with prior exposure to traumatic events ( $r = 0.27$ ,  $P = .018$ ) and duration of NICU stay ( $r = 0.35$ ,  $P = .002$ ). No other participant characteristics were associated with PTSD symptoms. In a *t* test, PTSD symptoms were significantly higher in participants who had a traumatic childbirth (mean = 21.98, SD = 18.98) compared with those who did not (mean = 12.12, SD = 8.82),  $t(74.97) = 3.11$ ,  $P = .003$ , Hedges'  $g = 0.60$ . However, when relevant covariates were included in a linear

**Table 2. Traumatic childbirth as a predictor of NICU stress<sup>a</sup>**

Criterion	Predictors	<i>b</i>	SE	<i>t</i>	<i>P</i>
PSS: NICU-SS	Time since birth	0.05	0.02	2.42	.019 <sup>b</sup>
	Duration of NICU stay	0.05	0.02	2.34	.022 <sup>b</sup>
	Traumatic childbirth	−0.35	1.10	0.32	.751
	Full model: $F_{(3,62)} = 4.44$ , $P = .007$ , $R^2 = 0.18$				
PSS: NICU-BAB	Time since birth	0.12	0.06	1.90	.062
	Duration of NICU stay	0.40	0.06	6.79	<.001 <sup>c</sup>
	Traumatic childbirth	1.40	3.33	0.42	.675
	Full model: $F_{(3,62)} = 20.26$ , $P < .001$ , $R^2 = 0.50$				
PSS: NICU-PRA	Time since birth	0.07	0.04	1.80	.077
	Duration of NICU stay	0.07	0.04	2.11	.039 <sup>b</sup>
	Traumatic childbirth	0.87	2.01	0.43	.668
	Full model: $F_{(3,62)} = 3.56$ , $P = .019$ , $R^2 = 0.15$				
PSS: NICU-total	Time since birth	0.24	0.10	2.49	.015 <sup>b</sup>
	Duration of NICU stay	0.52	0.09	5.81	<.001 <sup>c</sup>
	Traumatic childbirth	1.92	5.06	0.38	.706
	Full model: $F_{(3,62)} = 16.74$ , $P < .001$ , $R^2 = .45$				

Abbreviations: BAB, baby's appearance and behavior; NICU, neonatal intensive care unit; PRA, parental role alteration; PSS, Parental Stressor Scale; SE, standard error; SS, sights and sounds of the unit.

<sup>a</sup>Regression performed using simultaneous entry.

<sup>b</sup>Statistical significance at .05 level.

<sup>c</sup>Statistical significance at .01 level.

regression, traumatic childbirth was no longer a significant predictor of PTSD symptoms (see Table 3).

### NICU stress and PTSD

Linear regressions with simultaneous entry were performed to assess relationships between NICU stress and PTSD symptoms while accounting for relevant covariates (see Table 3). In separate analyses, the PSS: NICU-total and subscale scores were significant predictors of PTSD symptoms. As severity of perceived stress increased, PTSD symptom severity also increased.

### Moderating effects of NICU stress

Sixty-six participants had complete data available for the moderation analysis. The full model was significant, with 50% of the variance in PTSD symptoms explained (see Table 4). NICU stress was no longer a significant predictor of PTSD symptoms in the full model, but traumatic childbirth now was. The only other significant predictor was the interaction between traumatic childbirth and NICU stress, suggesting moderation had occurred.

The conditional effect of traumatic childbirth appraisal on PTSD symptom severity at different levels of NICU stress is illustrated in Figure 1. Low and high levels of stress were identified by subtracting or adding, respectively, the sample standard deviation (23.35) from/to the sample mean (71.95). At low levels of NICU stress, PTSD symptoms did not differ significantly

between participants who appraised childbirth as traumatic (mean = 4.82) and those who did not (mean = 10.46),  $b = -5.64$ , standard error [SE] = 4.73,  $t = 1.19$ ,  $P = .237$ , 95% confidence interval [CI] (−15.10, 3.81). Similarly, PTSD symptom severity did not differ significantly at moderate levels of stress, as participants who appraised childbirth as traumatic did not score differently on the PTSD measure (mean = 18.92) compared with those who did not (mean = 12.74),  $b = 6.18$ ,  $SE = 3.94$ ,  $t = 1.57$ ,  $P = .122$ , 95% CI (−1.69, 14.06). However, when NICU stress was high, participants who appraised childbirth as traumatic reported significantly higher PTSD symptom severity (mean = 33.02 vs mean = 15.01),  $b = 18.00$ ,  $SE = 7.18$ ,  $t = 2.51$ ,  $P = .015$ , 95% CI (3.65, 32.36). Thus, traumatic childbirth appraisal was positively associated with childbirth-specific PTSD symptoms only when NICU stress was high.

### Qualitative analysis

Just under half of participants ( $n = 36$ ) provided a response to the open-ended item assessing additional NICU-specific stressors. There were no differences in demographic or obstetrics characteristics between participants who provided a response and those who did not. However, participants who provided a response were more likely to appraise childbirth as traumatic [83.3% vs 53.7%,  $\chi^2(1) = 7.70$ ,  $P = .006$ , OR 4.32] and reported more severe PTSD symptoms [mean = 23.921, SD = 18.77; mean = 14.27, SD = 13.93,  $t(6.94) = 2.53$ ,

**Table 3. Traumatic childbirth and NICU stress as predictors of PTSD symptoms in linear regressions<sup>a</sup>**

Predictors	<i>b</i>	SE	<i>t</i>	<i>P</i>	95% CI
Time since birth	0.03	0.09	0.37	.716	−0.14 to 0.20
Duration of NICU stay	0.17	0.08	2.17	.034 <sup>b</sup>	0.01 to 0.33
Prior trauma	2.29	1.51	1.51	.136	−0.74 to 5.31
Traumatic childbirth	2.44	4.58	0.53	.596	−6.72 to 11.60
Full model: $F_{(4,61)} = 3.11$ , $P = .021$ , $R^2 = 0.17$					
Time since birth	−0.2	0.08	0.23	.816	−0.19 to 0.15
Duration of NICU stay	0.13	0.08	1.65	.105	−0.03 to 0.29
Prior trauma	2.57	1.41	1.83	.073	−0.24 to 5.39
PSS: NICU-SS	1.17	0.49	2.39	.020 <sup>b</sup>	0.19 to 2.16
Full model: $F_{(4,61)} = 4.73$ , $P = .002$ , $R^2 = 0.24$					
Time since birth	−0.05	0.07	0.79	.431	−0.19 to 0.08
Duration of NICU stay	−0.13	0.08	1.63	.108	−0.30 to 0.03
Prior trauma	0.93	1.20	0.78	.439	−1.46 to 3.32
PSS: NICU-BAB	0.83	0.14	6.01	<.001 <sup>c</sup>	0.55 to 1.11
Full model: $F_{(4,61)} = 13.84$ , $P < .001$ , $R^2 = 0.48$					
Time since birth	−0.01	0.08	0.08	.937	−0.17 to 0.16
Duration of NICU stay	0.13	0.08	1.71	.093	−0.02 to 0.29
Prior trauma	2.37	1.41	1.68	.098	−0.45 to 5.19
PSS: NICU-PRA	0.65	0.27	2.39	.020 <sup>b</sup>	0.11 to 1.18
Full model: $F_{(4,61)} = 4.74$ , $P = .002$ , $R^2 = 0.24$					
Time since birth	−0.08	0.07	1.12	.269	−0.22 to 0.06
Duration of NICU stay	−0.07	0.08	1.12	.269	−0.23 to 0.08
Prior trauma	1.48	1.22	1.22	.227	−0.95 to 3.91
PSS: NICU-total	0.51	0.09	5.53	<.001 <sup>c</sup>	0.33 to 0.70
Full model: $F_{(4,61)} = 12.19$ , $P < .001$ , $R^2 = 0.44$					

Abbreviations: BAB, baby's appearance and behavior; CI, confidence interval; NICU, neonatal intensive care unit; PRA, parental role alteration; PSS, Parental Stressor Scale; PTSD, posttraumatic stress disorder; SE, standard error; SS, sights and sounds of the unit.

<sup>a</sup>Regression performed using simultaneous entry.

<sup>b</sup>Statistical significance at .05 level.

<sup>c</sup>Statistical significance at .01 level.

$P = .014$ , Hedges'  $g = 0.59$ ] and greater stress on the PSS: NICU-BAB subscale [mean = 38.42, SD = 18.10; mean = 30.46, SD = 14.31,  $t(75) = 2.15$ ,  $P = .035$ ; Hedges'  $g = 0.49$ ]. We identified several themes that were repetitive of concepts already captured by

items on the PSS: NICU: (1) being separated from the baby or unable to hold the baby (PRA subscale); (2) seeing the baby undergo procedures (BAB subscale); (3) lack of privacy (PRA subscale); and (4) a busy NICU environment (SS subscale). We iden-

**Table 4. Prediction of PTSD scores by traumatic childbirth appraisal moderated by NICU stress<sup>a</sup>**

	<i>b</i>	SE	<i>t</i>	<i>P</i>	95% CI
Duration of NICU stay	−0.11	0.08	1.41	.164	−0.26 to 0.05
Time since birth	−0.08	0.07	1.11	.275	−0.22 to 0.06
Prior trauma	0.92	1.21	0.76	.453	−1.51 to 3.34
Traumatic childbirth appraisal	−30.24	13.19	2.29	.025 <sup>b</sup>	−56.63 to −3.85
NICU stress	0.10	0.18	0.53	.599	−0.27 to 0.47
NICU stress × traumatic childbirth	0.51	0.20	2.55	.013 <sup>b</sup>	0.11 to 0.90
Full model: $F_{(6,59)} = 9.92$ , $P \leq .001$ with $R^2 = 0.50$ ; $\Delta R^2 = 0.06$ , $P = 0.013$					

Abbreviations: CI, confidence interval; NICU, neonatal intensive care unit; PTSD, posttraumatic stress disorder; SE, standard error.

<sup>a</sup>Regression performed using simultaneous entry.

<sup>b</sup>Statistical significance at .05 level.



Table 5. Additional NICU-specific stressors identified by participants<sup>a</sup>

Themes/subthemes	%	Demonstrative quotations	Participant information
1. <i>Maternal emotional wellbeing</i>	41.7	"Also the guilt of being so sad, as a full-term mom of a healthy baby (required to have antibiotics as a preventative measure but infection never presented) surrounded of preemies & exhausted long term NICU parents."	Traumatic childbirth at full-term; 7 d in the NICU
Negative emotions	30.5		
Uncertainty	11.1		
Feeling exhausted	5.6	"It is very uncertain day to day. One day your baby could be doing wonderfully, and the next day, you can receive horrible news that makes the floor feel like it's dropping out from under you."	Traumatic childbirth at 26 wk; 56 d in the NICU
2. <i>NICU characteristics</i>	41.7	"The constantly changing nursing staff. Especially when my baby got better and they moved her to a level II style NICU. There are a lot of floating nurses and nurses from the mother and baby ward here. I don't know them as well as I know the Level III NICU nurses."	Nontraumatic childbirth at 33 wk; 47 d in the NICU
Restricted access	25.0		
Frequent staff changes	16.7		
Noise and lights	2.8	"Our NICU closed between 630a and 830a for shift changes. Also, one of the NICU doctors would close the NICU while doing his rounds. This could be upwards of 3+ hours. Not being able to have access to my child during these 'closed' times was so stressful. I hated it."	Traumatic childbirth at full-term; 13 d in the NICU
3. <i>Dissatisfaction with medical care</i>	33.3	"We called 6 times within 3 hours (dinner date) for updates and his nurse was too busy to speak with us."	Traumatic childbirth at 24 wk; 98 d in the NICU
Poor communication	22.2		
Distrust in the medical team	13.9	"Not having the nurses listen to me and them not knowing what was best for him. Having a nurse who force fed my child (pushed milk in the feeding tube) to the point he spit up violently. Then not being able to do anything about it for fear that the nurse would be worse to my son. Watching the nurses type on the computer while a baby was crying. Nurses taking too long to respond to the alarms and monitors going off."	Traumatic childbirth at 34 wk; 20 d in NICU
Feeling pressured by staff	8.3		
Unsupportive comments	2.8		
4. <i>Breastfeeding</i>	11	"I could only keep him off the lights for 45 minutes and had to check his temp, change his diaper, nurse, change his diaper again, and put him back under the lights in 45 minutes. This was extremely difficult because as a new mom I needed him to help me get my milk to come in. I would nurse 15 mins each side and then hand him off to either my mom or husband and then pump the rest of the time while they fed him pumped milk or formula."	Nontraumatic childbirth at 39 wk; 10 d in NICU
5. <i>Concern for baby's health status</i>	25.0	"My son has had complications that could be life threatening, and also had two blood transfusions. Every new invasive procedure or new complication was extremely stressful."	Traumatic childbirth at 32 wk; 38 d in NICU
Medical problems in the NICU	22.2		
Lasting child health problems	2.8	"having him self-extubate and not recover quickly thinking he wasn't going to make it."	Traumatic childbirth at 22 wk; 95 d in NICU
Stress affecting the baby	2.8		

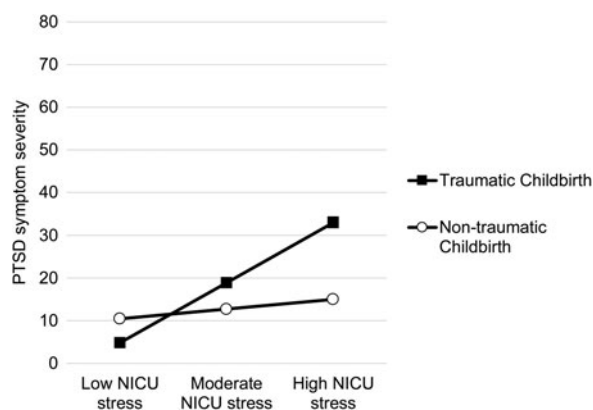
Abbreviation: NICU, neonatal intensive care unit.

<sup>a</sup>Percentages are based on  $n = 36$  responses; traumatic childbirth appraisal is drawn from current study results; duration of NICU hospitalization is number of days hospitalized at the time of study participation.

tified 5 additional themes that did not match items on the existing NICU stress measure. Theme, subthemes, and demonstrative quotations are displayed in Table 5.

## DISCUSSION

The literature has demonstrated that having a baby in the NICU is a stressful experience for most mothers, and this stress may be somehow related to PTSD



**Figure 1.** Conditional effect of traumatic childbirth appraisal on PTSD symptomology based on low and high levels of NICU stress. *Note:* Low and high values of NICU stress represent 1 standard deviation from the sample mean PSS: NICU score. Low = 48.60, moderate = 71.95, and high = 95.31. NICU indicates neonatal intensive care unit; PSS, Parental Stressor Scale; PTSD, posttraumatic stress disorder.

symptomology postpartum. However, PTSD symptoms must be assessed in relation to an identified traumatic stressor, and research to date has not yet explored PTSD symptoms specific to childbirth in a sample of NICU mothers. The current study provides insight into the relationships between NICU stress and PTSD symptoms using a temporal approach based on Ehlers & Clark's well-supported cognitive model of PTSD.<sup>23</sup> We first assessed for the presence of trauma appraisal during childbirth in accordance with *DSM-5*<sup>2</sup> criteria for a traumatic event and then evaluated NICU stress as a moderating factor contributing to postpartum PTSD. Results of this pilot study identify an opportunity to mitigate stress and PTSD delivered at the point of care: the NICU bedside.

In this sample of 77 mothers of infants who required NICU care, two-thirds of participants appraised childbirth as traumatic. The large proportion of participants who experienced traumatic childbirth is consistent with the literature suggesting that NICU mothers are at high risk to experience traumatic childbirth.<sup>11,19,22</sup> As hypothesized, trauma appraisal was associated with PTSD symptoms only when NICU stress was high. As such, it is important to identify risk factors for each occurrence: initial appraisal of childbirth as traumatic, high perceived stress, and PTSD symptomology.

Traumatic childbirth was more likely for participants who gave birth via C-section or to infants who required longer NICU care. Instrumental vaginal and surgical births are a known contributor to traumatic childbirth,<sup>3</sup> likely due in part to higher perceived risk during birth. Similarly, as duration of NICU stay was strongly corre-

lated with gestational age, maternal perceived risk for infant safety during birth was likely higher due to physician counseling regarding risks of preterm delivery. Both surgical and preterm births are also associated with longer, more complicated recovery during the postpartum period. Participants who had a traumatic childbirth reported higher NICU stress, which is the first sign that perceived risk during childbirth and postpartum experiences likely interact.

In the moderation analysis, a relationship between trauma appraisal and PTSD symptom severity existed when mothers experienced high perceived stress. In accordance with theories of PTSD maintenance<sup>23</sup> and perceived stress,<sup>32</sup> the experience of NICU stress may be a maintenance factor perpetuating the perception of a threat to the infant's safety. These negative appraisals may interfere with coping, thus reciprocally increasing stress. In a study of coping in NICU mothers, Shaw and colleagues<sup>33</sup> found that dysfunctional coping style assessed soon after childbirth was related to increased likelihood to experience clinically significant PTSD at 1 month postpartum. Interventions aimed at utilizing adaptive coping strategies may contribute to decreased stress and, thus, decreased PTSD symptomology.

The PSS: NICU is a validated measure of NICU-specific perceived stress that captures multiple facets of the parental NICU experience. However, it likely underestimates the degree of stress experienced by NICU parents, which is emphasized by our qualitative analysis. While several identified themes (ie, characteristics of the NICU environment, breastfeeding, and concern for the baby's health status) align well with the current PSS: NICU domains, maternal emotional well-being and interpersonal interactions surrounding NICU care are not captured by the measure. Forty-two percent of open-ended responses assessing additional NICU stressors mentioned distressing maternal emotional experiences (eg, feeling guilty, sad, and anxious), and nearly 33% mentioned dissatisfaction with their infant's medical care. These are important areas to acknowledge, assess, and treat in this population. With more comprehensive measurement of perceived NICU stress, the relationship between trauma appraisal and PTSD symptomology may be even stronger when stress is high.

While over two-thirds of the sample appraised childbirth as traumatic, only a subset of these women (35%) scored above the clinical cutoff for PTSD. The overall rate of PTSD reported here is somewhat higher than previously published reports identifying about 15% to 18% of NICU mothers with postpartum PTSD.<sup>7,20,34</sup> This variation is likely due to sampling and measurement differences in this cross-sectional, convenience sample. Nonetheless, it supports the growing body of literature



emphasizing the importance of integrating maternal trauma screening into pediatric care during the postpartum period.<sup>35</sup>

Unsurprisingly, historical trauma exposure was associated with childbirth trauma. Prior trauma exposure was higher in women who appraised their childbirth as traumatic, and cumulative lifetime traumatic experiences were correlated with PTSD symptom severity. Trauma exposure is a known risk factor for PTSD in general and specifically in NICU samples.<sup>18</sup> Although not the focus of this study, it is important to note that history of traumatic experiences is linked with high-risk pregnancy, which in-turn increases likelihood for NICU hospitalization.<sup>36</sup> Therefore, there may be a higher incidence of historical trauma in NICU mothers, which points to a need for trauma-informed practices to be integrated into clinical obstetrics and NICU care.<sup>37,38</sup> Trauma-informed practices acknowledge the harm caused by past trauma and aim to provide clinical care in a way that resists retraumatization and promotes resilience.<sup>39</sup> In NICU care this may entail modifying practices to enhance patients' privacy, comfort, and control.<sup>38</sup>

Although this study contributes to the existing literature, there are some limitations to the findings presented in this article. The current sample was demographically homogenous. Participants were mostly married, educated, White women. This is problematic, because there are higher rates of trauma among racial minority women and low-income populations in the United States,<sup>2</sup> and rates of NICU hospitalization tend to be higher among racial minority infants. Additionally, there is some evidence that Black women experience a higher degree of perceived stress related to infant hospitalization.<sup>18</sup> Recruitment was also limited to those who had the means to utilize the technology, came across the study advertisement, could read English, and were willing to report personal experiences of trauma and distress. Online recruitment can influence study results, as Ayers and colleagues<sup>40</sup> demonstrated that online samples may report higher rates of a traumatic childbirth and postnatal PTSD than community-recruited samples. Thus, it may be difficult to generalize these results to a true patient population. Additionally, measurement was cross-sectional and retrospective. The reciprocal relationships among PTSD, stress, and coping require longitudinal attention to infer causal relationships. We attempted to minimize the effects of delayed recall by limiting study participation to the first 4 months postpartum, but participants may still have experienced error in recall. Finally, trauma was assessed directly related to childbirth. It is possible that mothers experienced traumatic events during the NICU stay that contributed to PTSD.

## CONCLUSION

The high rates of traumatic childbirth and PTSD in this sample add to the body of literature suggesting that many NICU mothers are in distress during and/or soon after giving birth. This statement is supported in participants' report of maternal distress as a common NICU stressor. This study also expands on existing research by identifying NICU-specific maternal stress as a potential prevention and treatment target for postpartum PTSD. Given the demonstrated interaction between childbirth and postpartum experiences, it is imperative that we develop wraparound care in which postpartum and NICU care also interact. Educating maternal-child healthcare professionals on the common nature of maternal distress related to NICU care may aid in better recognition of PTSD symptoms, ultimately leading to improved clinical care. Furthermore, this research supports the utilization of evidence-based, trauma-informed practice in the NICU. As 33% of participants noted dissatisfaction with their infant's care as a NICU-specific stressor, these strategies may improve patient satisfaction, thus decreasing perceived stress. Utilizing a longitudinal approach to better understand the progression, maintenance, exacerbation, and resolution of postpartum trauma symptoms is an important next step to inform treatment development. With better understanding, we will be able to identify key aspects of the prevention and treatment of postpartum PTSD.

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