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Research Article

The Effect of Maternal Emotion and Discomfort on Breastfeeding Realization Scores

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ABSTRACT

Background: Exclusive breastfeeding (EBF) outcomes can vary by concomitant emotions and breastfeeding self-efficacy. Ongoing pain during breastfeeding, concomitant emotions, and breastfeeding self-efficacy scores (BSES) have not been explored in association with EBF at 6 weeks postpartum.

Research Aims: To examine the association of ongoing pain with breastfeeding, concomitant emotions and BSES with EBF outcomes at 6 weeks postpartum.

Method: A secondary analysis of a randomized pilot trial of a breastfeeding pain self-management (BSM) intervention for 56 mothers (26 BSM, 30 controls). The BSM intervention provided self-management strategies for breastfeeding and breastfeeding pain. Using multiple regression analyses, associated symptoms of depression, anxiety, sleep, well-being pain severity scores, BSES, and group assignment was assessed related to EBF at 6 weeks postpartum.

Results: EBF was significantly associated with Group, depression, anxiety, sleep, BSES, and pain severity, ($F(6, 49)=5.751$, $p<0.000$, $R2=0.413$) BSES ($p<0.005$) and anxiety ($p<0.041$) were significant variables in the prediction model. A second model which included Group, BSES, pain severity, anxiety, depression, sleep and well-being was significantly associated with EBF ($F(7, 49)=4,728$, $p<0.0004$, $R2=0.403$). BSES again, significantly added to the prediction, $p<0.002$

Conclusion: Examinations of EBF at 6 weeks should include evaluation of mothers' ongoing pain and emotional distress, as mothers continue to breastfeeding even at personal cost. Early validation of breastfeeding challenges, ongoing pain, and emotional distress are needed to bolster mothers' confidence in their breastfeeding skills, thus supporting their EBF goals.

Keywords: Breastfeeding; Pain; Self-Management; Emotion

INTRODUCTION

For some women, the "Natural" task of breastfeeding can be a roller coaster of emotions and include tenderness of breast and nipple tissue. Although tenderness might be expected for a short time as lactating tissue transitions from inactivity to milk production and breastfeeding, pain should not be a part of breastfeeding. Pain during lactation is an indicator of malfunction and is a leading cause of 1 million mother's distress, heavily influencing feeding decisions [1] and early weaning [2]. Additional studies have confirmed women who continue to experience pain as lactation progresses are at greater risk for increased mood disturbances, increasing interference with activities of daily living, and changes in sleep cycles breastfeeding self-efficacy [3-6]. Unresolved pain during breastfeeding may also affect maternal self-efficacy and bonding, which may have an enduring and negative impact on the maternal/infant dyad [2,7,8].

For those women experiencing unresolved pain during breastfeeding, complex stimulation from the glandular, somatic, and visceral tissues are transmitted via nociceptors pathways, create difficulties in distinguishing separate triggers of pain [9,10]. Biologic factors (infection) and anatomic factors (positioning challenges, infant anatomic issue such as ankyloglossia or torticollis, abnormal nipple shape or size) are among the triggers for ongoing pain and activation of these nociceptor pathways [11-13]. In the CASTLE (Candida and Staphylococcus Transmission: Longitudinal Evaluation) study [14], almost 20% of women reported persistent nipple pain at 6–8 weeks postpartum [14]. In the first 6 weeks of breastfeeding, women with acute and ongoing nipple pain without visible trauma used words such as

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"radiating" to describe their discomfort, while women with visible nipple trauma use descriptors such as "piercing" or "sharp" [15]. Women also described their breast and nipple pain with affective words, such as "frightful", "terrifying", "dreadful", and "being in hell" [16,5].

Emotional reactions to pain can suppress or amplify the perception of painful stimuli. In fact, emotion is included in the 1994 definition of pain adopted by the International Association for the Study of Pain. Over the last 25 years, significant associations between pain and negative emotion have become well established [17-19]. The connections between emotional reactions and painful stimuli are often described through approach-avoidance models when achieving a goal involving both positive and negative experiences. For example, the affirming and relaxing bonding experiences with the newborn draw mothers into and amplifies her motivation towards breastfeeding behavior, whereas any discomfort or pain will act as a deterrent on motivation and increase avoidance of breastfeeding.

Approach-avoidance models directly address the emotional, cognitive, and motivational influences on individual's behavioral responses to pain [20-22]. Employing these models in intervention design can reduce the obstacles psychological stress, depression, and anxiety often seen in chronic disease management, and to new mothers' abilities to manage their health and comfort while pursuing their goals to breastfeed their infant over the weeks and months after birth [23,24]. Uniquely taxing for mothers' emotional regulation skills are the deregulating effects of sleep/wake cycle disruptions [25-27]. Breast and nipple pain is associated with changes in sleep cycles as well as increased pain interference with activities of daily living and maternal mood [5].

The strain of managing breastfeeding in this sleepless context can cause distress and interfere with mothers' ability to

- Focus on her postpartum needs,
- Impair problem-solving,
- Prioritize capabilities, and finally
- Engage in self-management activities [28,29].

Relatedly, breastfeeding self-efficacy reflects maternal confidence to manage breastfeeding and meet their breastfeeding goals. Dennis theorized that breastfeeding self-efficacy includes the confidence to successfully manage pain and emotions, particularly anxiety during breastfeeding. Yet, it is clear that with increased pain, there is decreased breastfeeding self-efficacy, increased emotional distress and a higher rate of mothers not reaching their breastfeeding goals [30,31].

Key messages

- The effect of emotion on breastfeeding pain is not consistently included in the support and evaluation of breastfeeding, which becomes a barrier for women to exclusively breastfeed. Empowering mothers with the skills needed to self-manage pain and anxiety in the first weeks after birth increases mothers' self-efficacy to exclusively breastfeed.
- Mothers receiving real-time breastfeeding support during the first weeks after birth report decreased pain, and increased breastfeeding self-efficacy which supports exclusive breastfeeding at 6 weeks.

Research aims and current study

Our pilot randomized trial (RCT) used a Breastfeeding Pain Self-Management (BSM) intervention to target pain self-management and to support EBF [15]. The goal of the study was to decrease mothers' breast and nipple pain using self-management strategies. The BSM intervention significantly decreased breastfeeding pain during the first two weeks postpartum [15]. However, at 6 weeks, there was no significant difference between groups for ongoing pain (p=0.368) and EBF (p=0.092). This secondary analysis explores the associations between EBF and concomitant symptoms of depression, anxiety, sleep, general well-being, and breastfeeding self-efficacy at 6 weeks as moderated by the BSM intervention. We hypothesize that EBF at 6 weeks will be associated with decreased pain and symptoms of depression, anxiety and sleep disruption and increased self-efficacy and perceived well-being. Importantly, given a lack of significant difference between groups for pain and breastfeeding at 6 weeks, we do not test for group assignment.

MATERIALS AND METHODS

Study Design

This report is a secondary analysis of selected data collected in a pilot RCT of the BSM intervention among breastfeeding women in 2017. All study materials were approved by the University Institutional Review Board and registered with Clinical Trials.gov (NCT03392675).

Setting

Participants were recruited at two research-intensive regional tertiary medical centers in the northeast region of the United States.

Sample

A convenience sample of 80 participants were approached and 65 participants consented during recruitment before hospital discharge and followed-up at 1,2, and 6-weeks after delivery. Five women (BSM intervention) consented but did not complete the initial documents precluding enrollment, and 4 women (1 BSM, 3 control) stopped breastfeeding before 6 weeks. A total of 56 women (26 interventions, 30 control via randomization schedule) completed surveys and were breastfeeding at 6 weeks and were included in this analysis. The pilot RCT was a feasibility study, with a sample size goal of 60 women which was large enough to report significant differences in average breastfeeding pain severity scores between the BSM and control groups.

Inclusion criteria for this study required mothers were

- 18-45 years of age;
- Breastfeeding to at least 6 weeks;
- Had a full-term infant (38-42 gestational weeks) without medical complications;
- Read and speak English, and
- Had daily access to a smartphone or computer.

Exclusion criteria included

- Women who had a history of potential changes in pain sensorium such as significant mental health disorder (i.e. schizophrenia, bipolar disorder);
- Health condition(s) not associated with pregnancy (i.e. sickle cell anemia, HIV+, diabetes, history of seizures);
- Delivered twin infants, or an infant with congenital anomalies or ankyloglossia that would interfere with breastfeeding; and
- Stopped breastfeeding before 6 weeks.

Measurements

Every week participants were asked to complete assessments of breast and nipple pain intensity using a horizontal visual analogue scale with fixed intervals between 0-100, and reported frequency and type of daily feedings (breast, breast milk in a bottle, or formula) [32]. The 14-item Breastfeeding Self-Efficacy

Scale-Short Form (BSES-SF) assessed maternal confidence with breastfeeding. BSES scores >50 indicate greater maternal breastfeeding confidence with a Cronbach's alphas of 0.94 [33]. Maternal emotion was assessed by the 6-item Patient Reported Outcomes Measurement Information System (PROMIS®) for anxiety, and sleep (Cronbach's alpha=0.79 – 0.91) as shown in Table 1.

Table 1: Baseline PROMIS Scale Descriptive Details.

PROMIS Scale	Cronbach α	N	M	S
Anxiety	0.8	6	7.5	2.2
Sleep	0.82	6	11.8	3.5
Depression	0.73	6	7.4	1.8
Global Health	0.6	10	36.7	4.1

The 10-item PROMIS Global Health measured overall wellbeing (quality of life, mental health, satisfaction with social activities, and emotional problems) with Cronbach's alphas of 0.81-0.85 [34]. Depressive symptoms were measured by the Edinburgh Postnatal Depression Scale (EPDS). The EPDS is a 10 item scale with each item having 4 choices (0-4). Any total score >10 indicates risk for possible depression and scores >13 a depressive illness that requires referral. The scale has a sensitivity of 85%, specificity of 77% to identify women at high-risk for depression [35].

Data Collection

The BSM intervention was implemented from hospital discharge to 6 weeks, and included bi-weekly nurse-led texting, access to online educational modules targeting knowledge and beliefs to self-manage breastfeeding and breast and nipple pain, and a breastfeeding diary. Women in the intervention group also received bi-weekly cognitive therapy-based educational modules addressing challenges in breastfeeding and examples as to how to manage breast and nipple discomfort, and hyperlinks to online resources for the first 2 weeks from discharge.

The control group had access to usual care, including access to an outpatient lactation consultant. Both the BSM intervention and control groups received text/email at 1, 2, and 6 weeks, with a link to complete assessments for maternal report of breast and nipple pain severity, symptoms of anxiety, depression, and sleep disruption, breastfeeding self-efficacy, and breast and formula feeding frequency. Additionally, the PROMIS measures for Anxiety, Sleep, and Global Health were measured at baseline and 6 weeks.

Data Analysis

Key variables of interest were assessed to determine whether assumptions of normality were met. Analysis used independent sample t-tests on continuous demographic variables between the two groups and Pearson Chi-Square test to verify the non-significant difference of discrete characteristics. Multivariable Linear regression was used to test study hypotheses. The first model describes the relationship between EBF and Depression, Pain Severity, Anxiety, Sleep, and BSES as explanatory variables at 6 weeks. A second model evaluated EBF and Well-being, Pain Severity, and BSES as explanatory variables at 6 weeks.

RESULTS

In comparing the two groups at baseline, there were no significant differences in demographic data; further, there were no group differences in Global Health, Pain Severity, Depression, Sleep, Anxiety, or BSES scores (Table 2).

At six weeks, the intervention group had lower mean scores for pain severity, anxiety, depression, and sleep compared to the control group. Importantly, 7 intervention group participants had pain severity scores above 10, compared to 13 control group participants with a pain severity score above a 10 as shown in Table 3.

Table 2: Demographic Characteristics by Group.

Characteristic	BSM (N=26)		Control (N=30)		Test α
	M	SD	M	SD	p-value
Age	30.04	4.67	30.67	5.08	0.632
	n	%	n	%	
Race					0.91
White	22	84.6	21	70	
Asian	2	7.7	1	3.3	
Black or African	2	7.7	4	13.3	
American					
Not reported	0	0	4	13.3	
Ethnicity					0.967
Hispanic or Latino	3	11.5	4	13.3	
Not Hispanic or Latino	20	76.9	23	76.7	
Unknown or Not Reported	3	11.5	3	10	
Education					0.68
High school or below	6	23.1	6	20.2	
College	10	38.5	15	50	
Graduate School	10	38.5	9	30	

Family Income					
Less than $50,000	6	23	8	26.7	0.889
$51,000-$75,000	3	11.5	2	6.7	
$76,000-$100,000	8	30.8	8	26.7	
Greater than $100,000	9	34.6	12	40	
Marital Status					
Single	8	30.8	9	30	0.992
Married	17	65.4	20	66.7	
Not Reported	1	3.8	1	33.3	
Working (Yes)	20	76.9	26	86.7	0.343
Parity (1 = Yes)	10	38.5	13	43.3	0.717
Delivery (Vaginal)	20	76.9	25	83.3	0.547

Note: α Two sample t-test for continuous demographics variables, * Pearson chi-square for discrete demographic variables, Fisher's exact test for breastfeeding duration.

Table 3: Pain Severity Changes from 2 to 6 weeks.

Rating	Full Sample N= 6; n (%)	Control Group; N=30; n (%)		Intervention Group N=26; n (%)	
		Exclusive Breastfeeding	Mixed Feeding	Exclusive Breastfeeding	Mixed Feeding
Same	8 (14.3)	1 (5.3)	3 (27.3)	2 (10.5%)	2 (28.6)
Worsened	12 (21.4)	1 (5.3)	5 (45.4)	3 (15.8%)	3 (42.9)
Improved	36 (64.3)	17 (89.4)	3 (27.3)	14 (73.7%)	2 (28.5)
Total	56	19	11	19	7

Exclusive breastfeeding and concomitant symptoms

A multiple regression was completed for the total sample to predict EBF at 6 weeks postpartum from BSES, pain severity, anxiety, depression, and sleep. These variables statistically significantly predicted EBF, $F(5,50)=6.358$, $p<0.000$,$R2=0.328$. BSES added statistically significantly to the prediction ($p<0.002$), with pain severity ($p<0.063$) and CA ($p<0.62$) adding interest to the model. A multiple regression was completed for control group to predict EBF at 6 weeks postpartum from BSES, pain severity, anxiety, depression, and sleep. These variables statistically significantly predicted EBF, $F(5, 24)=2.978$, $p<0.031$, $R2=0.383$. Pain severity as an added predictor trended toward significance ($p<0.056$).

A multiple regression was completed for intervention group to predict EBF at 6 weeks postpartum from BSES, pain severity, anxiety, depression, and sleep. These variables statistically significantly predicted EBF, $F(5, 20)=2.978$, $p <0.013$, $R2=0.489$. BSES was a statistically significant addition to the prediction ($p<0.041$) while anxiety was not ($p<0.062$).

Exclusive breastfeeding and general well-being

A multiple regression was completed for EBF at 6 weeks postpartum from BSES, pain severity, and global health. These variables statistically significantly predicted EBF, $F(3,52)=32.393$, $p<0.0005$, $R2=0.577$. For the control group, these variables statistically significantly predicted exclusive breastfeeding, $F(3,26)=4.599$, $p<0.010$, $R2=0.347$ and for the intervention group, these variables statistically significantly predicted exclusive breastfeeding, $F(3,22)=4.497$, $p<0.013$, $R2=0.380$. No coefficients added significantly to any of these models.

DISCUSSION

Mothers in the BSM intervention group had higher BSES scores compared to the control group. These mothers received early validation that their breastfeeding pain was real and self-management strategies to address their pain and anxiety during breastfeeding across the six weeks. In contrast, mothers in the control group required six weeks to decrease their pain severity scores but had lower BSES. These results may indicate the ongoing presence of breastfeeding pain represents an opportunity to address the self-management of breastfeeding pain as a pathway to increasing breastfeeding self-efficacy [21,36].

In the larger study, we found no significant difference in EBF at 1 month, however, the number of direct feedings ranged between 1-20 times/day. At six weeks, 36% of participants did not have improvement or resolution of their pain. Taken together, these findings indicate women will persist with breastfeeding even at great personal cost. We found that women who were able to manage the key factors of anxiety, depression, and sleep as indicated by improved measure score, also had decreased pain. Women in the intervention group experienced less emotional distress and decreased pain severity at 6 weeks postpartum.

In this light, a woman's ability to regulate her emotions is pivotal to breastfeeding success and to her recollection of her breastfeeding goals and informing her future breastfeeding decisions [21]. Russell and Park [37] describe the ability to self-manage positive and negative emotions as pivotal to resilience during intense, transient, or continuously stressful life events. In comparison to other clinical pain conditions, postpartum women also experience ongoing breastfeeding pain and co-occurring symptoms of anxiety, fatigue, and depression; these may affect pain perception and decrease health self-efficacy [38-41].

Breastfeeding is a unique health behavior because of its cultural value, powerful health impacts, and because it has become common in the United States for a proportion of mothers to

experience extended pain and discomfort. Women understand that breastfeeding is pivotal for the infant's health, maternal-infant attachment, and is culturally important [21]. In our larger study, although women experienced pain during breastfeeding at 1 and 2 weeks, there was no significant relationship between early discomfort and exclusive breastfeeding at 6 weeks [32].

This result suggests that women may continue breastfeeding despite experiencing pain and discomfort that endures for multiple weeks. This result is in line with Schwartz [42], who found that each day of pain during the first 3 weeks of breastfeeding increased the risk of discontinuing breastfeeding by 10-26% (leading to formula use and lower maternal self-efficacy), however, after 3 weeks, women no longer reported pain as a reason for breastfeeding cessation. In fact, women who persevered through pain, express feelings of empowerment [42]. Unresolved pain during breastfeeding may also affect maternal self-efficacy and bonding which may have an enduring and negative impact on the maternal/infant dyad [4,8,43].

The consequences of breast and nipple pain extend far beyond physical and neurosensory systems and intrude into the whole of a woman's life with impacts on her affective, cognitive, and social functioning [3,4,6]. Thus, breast and nipple pain interventions need to integrate emotion regulation considerations in self-management plans for breast and nipple pain in order to increase women's ability to modulate or persevere in the face of pain [44]. Women's negative emotional experiences do affect their personal breastfeeding perception and breastfeeding outcomes. In the Mood, Mother, and Infant Study, women's anxiety and depression after delivery was associated with earlier introduction of formula and breastfeeding cessation [23].

These findings reinforce the importance of providing real-time support for women in the first months after birth to realize their breastfeeding goals against any pain, discomfort, and resulting emotional distress. Specifically, when women are psychologically distressed (experiencing stress, depression, or anxiety), they experience increased illness symptomology including pain [41,45,46], and may form inaccurate illness perceptions that interfere with adaptive self-management behaviors [10,36]. Birth and establishing breastfeeding require resilience and self-management, yet the effect of psychological distress is often not considered as a contributor to women's continuing breast and nipple discomfort and pain [15,47]. Further, there is evidence that psychological distress is the single best predictor of pain-related disability [47].

The transition to motherhood is an emotional time that can tax on emotion regulation skills as a result of the deregulating effects of sleep/wake cycle disruptions [25-27], shifts in social roles and partnership dynamics [48,49] and rapid neurohormonal changes [50,51] that are common in the postpartum period. For a new mother, this constellation of experiences is impacted by the "natural" task of breastfeeding, which can be fraught with anxiety and new sensations. It is well established that after delivery, women experience pain as a primary trigger of emotional deregulation. For example, women who stop breastfeeding due to breast and nipple pain are more likely to be depressed and express feelings of inadequacy and guilt [2].

Our results suggest there may be a set of teachable self-management skills that help breastfeeding women persist despite enduring painful experiences. At week 6, increased breastfeeding self-efficacy scores significantly predicted improved symptoms of anxiety, depression, fatigue and sleep disturbances, aligning with the literature [52-54,15,46]. These findings are also aligned with qualitative evidence from Kronborg and colleagues who identify key themes in women's narrative themes in establishing a breastfeeding-bonding trajectory that highlight anxious breastfeeding experiences including insecurity, worry, and fear (i.e., concerns about milk production, social approval, and feeding capability).

Future studies might consider intervening with targeted emotional support in addition breastfeeding self-management skills during the first 1 to 2 weeks and continue with emotional support until at least 6 weeks. For clinicians, it is important to validate women's report of breast and nipple pain and provide women with reassurance regarding their anxiety related to breastfeeding. Together, these will decrease ongoing breastfeeding pain and support women's realization of their breastfeeding goals.

LIMITATIONS

Our study findings are limited due to sample size and the secondary analysis design. We did not assess emotion regulation constructs each week, including anxiety as a key variable of interest; further, at 6 weeks many issues related to breastfeeding were resolving. Our pilot findings strongly suggest that the pivotal time for addressing pain self-management and its emotional correlates in an intervention is in the first weeks directly following birth when pain is a significant risk for stopping breastfeeding [21,42,55].

CONCLUSION

The consequences of breast and nipple pain extend far beyond physical and neurosensory systems and intrude into the whole of a mother's life, in affective, cognitive, and social function. Thus, breast and nipple pain interventions need to integrate self-management for specific conditions related to breast and nipple pain with emotion regulation in order to increase women's ability to regulate and modify pain in all dimensions. Empowering women with the skills needed to self-manage anxiety and pain by providing real-time support in the first weeks after birth could lead to women to improved realization of their breastfeeding goals.

Women seeking support for pain need to have the validation from their care providers that their pain is real but a manageable challenge. It is imperative that resources are available to assist women to set expectations and provide support should pain and its associated emotional experiences persist. Additional work needs to be done to find effective ways to collaborate with women about their expectations and how they manage their pain if it develops and persists. This work is crucial to developing self-management interventions that acknowledge and consider emotional experiences that may arise when they persist even when "It hurts".

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CONFLICT OF INTERESTS

None of the authors declare a conflict of interest or financial conflict of interest with any sponsoring organization and the for-profit interests the organization represents.

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