THE EFFECT OF SKIN-TO-SKIN CARE ON MOTHERS
WITH UNMET BREASTFEEDING EXPECTATIONS

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THE EFFECT OF SKIN-TO-SKIN CARE ON MOTHERS WITH UNMET BREASTFEEDING EXPECTATIONS

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Abstract

THE EFFECT OF SKIN-TO-SKIN CARE ON MOTHERS WITH UNMET BREASTEEDING EXPECTATIONS

Gretchen Ann-Becker Crabb

Under the Supervision of Dr. Damira Grady, PhD

World Health Organization officials (WHO, 2013b) recognize exclusive breastfeeding as the gold standard of infant feeding practices because of the many benefits for mothers and babies. However, some mothers are not able to breastfeed their infants at all or for the length of time they intend. This can result in feelings of shame, guilt, or disappointment that can affect their perception of themselves as mothers. Women who set out to breastfeed their babies but do not meet their breastfeeding expectations are more likely to experience postpartum depression, which has a negative impact on maternal/infant psychological, physiological and developmental health. Thus, it is imperative that mothers with unmet breastfeeding goals receive support and strategies that may help to both prevent and reduce contributing symptoms of postpartum depression. Skin-to-skin care offers mothers a no-cost, easy to use opportunity to connect with their babies in a way that has been shown to improve physiological and emotional outcomes for the dyad.

Key Terms: Unmet breastfeeding goals, breastfeeding cessation, postpartum depression, skin-to-skin care, kangaroo care

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Chapter One: Introduction

Overview

Breastfeeding provides the optimal start to life for infants and their mothers. However, for mothers who intend to breastfeed but are unable to achieve their goals, their physiological and psychological well-being and that of their infants' may be effected. Medical professionals and peer to peer groups who support peri- and postpartum women are in a unique position to positively impact mother and infant health and relationships when breastfeeding goals are unmet by promoting skin-to-skin care. This literature review will explore the following questions: What is the impact of unmet exclusive breastfeeding goals on maternal mental health? In what ways does postpartum depression affect the maternal/infant dyad neurobiologically and socially? What is the relationship between postpartum depression and breastfeeding? How does skin-to-skin care impact the physiology of the mother and infant? Does utilizing skin-to-skin care prevent and minimize symptoms of postpartum depression in mothers with unmet exclusive breastfeeding expectations?

Statement of the Problem

World Health Organization officials (WHO, 2013a) recommend exclusive breastfeeding for the first 6 months of life because of the physiological, social-emotional and economic benefits. The Office of Disease Prevention and Health Promotion representatives (2010) in their Healthy People 2020 initiative set forth breastfeeding goals--46.2% of exclusive breastfeeding for 3 months and 25.5% of infants up to 6 months of age--to reduce the health risks for mothers who do not breastfeed, such as increased rates of breast cancer, ovarian cancer and diabetes mellitus (U.S. Department of Health and Human Services, 2011; Chowdhury et al., 2015). The Surgeon General's Call to Action to Support Breastfeeding, written by the U.S. Department of

Health and Human Services (2011), reported that infants who were not breastfed showed increased health risks for acute ear infections, eczema (atopic dermatitis), diarrhea and vomiting (gastrointestinal infection), hospitalization for lower respiratory tract diseases, asthma, childhood obesity and type 2 diabetes mellitus, leukemia, sudden infant death syndrome, and necrotizing enterocolitis in preterm infants.

The emotional benefits of breastfeeding also reflect an increase in maternal sensitivity, and hypothetically, attachment of the dyad. Using continuous measures of attachment security, Tharner et al. (2012), found that mothers who breastfed for 6 months demonstrated an increase in sensitive responsiveness to their infant. In addition, more attachment security and less attachment disorganization was evident within the breastfeeding dyads. At 5 months postpartum, mothers who fed their infants formula milk scored significantly higher on the bonding questionnaire (a higher score referred to a negative mother-child bond) when compared to breastfeeding mothers (Nishioka et al., 2011).

Even with these health and social-emotional benefits, as of 2006 achievement of exclusive breastfeeding goals were only at 33.6% for mothers' breastfeeding at 3 months and 14.1% for mothers' breastfeeding up to 6 months (Office of Disease Prevention and Health Promotion, 2010). In their analysis of the Infant Feeding Practices Study II, a large scale longitudinal study completed in the US in 2008, Odom, Ruowei, Scanion, Perrine, and Grummer-Strawn (2013) found that 60% (n=1177) of postpartum women reported they did not breastfeed their babies as long as they had intended. This begs the question, why do mothers stop breastfeeding given the social and physical benefits? What are the effects? A British survey that used the Avon Longitudinal Study of Parents and Children (n= 14,541 pregnancies), indicated that mothers with unmet exclusive breastfeeding goals had a more significant risk of

postpartum depression as measured by the Edinburgh Postnatal Depression Scale (EPDS) when compared to mothers who planned to breastfeed or bottle feed and achieved those goals (Borra, Iacovou & Sevilla, 2015). Gregory, Butz, Ghazarian, Gross, and Johnson (2015) found "adjusted odds of depressive symptoms were lower among women meeting prenatal exclusive breastfeeding expectations versus those who were not (odds ratio .71, 95% confidence interval 0.52-0.96)" (p. 319). However, current research is inconclusive as to whether depression leads to breastfeeding cessation or if breastfeeding cessation leads to postpartum depression. For example, Woolhouse, James, Gartland, McDonald, and Brown (2016) found that mothers with depressive symptoms at 3 months were less likely to be breastfeeding at 6 months than women who did not report symptoms. Ystrom (2012) reported breastfeeding cessation (especially women who had a prenatal history of anxiety and depression) was related to an increase in postpartum depression.

Various factors influence the risks for postpartum depression in mothers who cease breastfeeding. Physiological influences such as pain, decreased milk supply and difficult latch can effect women's breastfeeding results. Watkins, Meltzer-Brody, Zolnoun, and Stuebe (2011) found that mothers who experienced significant breastfeeding pain were more likely to be depressed. Neurophysiological changes also lead to breastfeeding cessation. Stuebe, Grewen, Pedersen, Propper, and Meltzer-Brody (2012) reported, "disruption of oxytocin and prolactin may diminish the stress-attenuating effects of breastfeeding, reducing maternal enjoyment of breastfeeding and leading to earlier weaning" (p. 267). Kehler, Caput, and Tough (2009) stated that significant social risk factors related to breastfeeding cessation included working full-time or intending to within the first year postpartum, a history of depression, depression or anxiety during pregnancy, and/or poor social supports.

Maternal postpartum depression significantly affects the dyad risking the parent/infant attachment process and the behavioral, social, and cognitive developmental trajectory of the infant. Tactile, vocal, and facial communication are all affected in depressed mothers. As a result, infants of depressed mothers "smile less and frown more, are irritable and difficult to console, tend to be more withdrawn and less responsive" (Wisner, 2016). It is crucial that mothers who cannot meet their breastfeeding goals are offered alternative strategies to protect infant attachment through at breast or other sensory activities that would mirror the breastfeeding relationship.

Skin-to-skin care or kangaroo care is the process by which the mother (or other caregiver) places the unclothed, diapered newborn on her chest in a prone position between the breasts. It is a technique that is available to everyone, safe to administer and is of no cost to the family. Bigelow, Power, MacLellan-Peters, Alex, and McDonald (2012) found that "mother/infant SSC lessened mothers' self-reported depressive symptoms and reduced mothers' physiological stress in the first postpartum weeks" (p. 376). Skin-to-skin care increases oxytocin, and dampens dysregulation of the hypothalamic-pituitary-adrenocortical (HPA) axis. Researchers who examined the relationship between skin-to-skin care, maternal depression and stress in a randomized trial found that infants who participated in almost continuous skin-to-skin care showed less cortisol reactivity in response to a stressor, and maternal and infant cortisol levels were more closely matched than the control group that provided standard care (Mörelius, Örtenstrand, Theodorsson, & Frostell, 2015). According to Feldman-Winter et al. (2016), "In pre-term infants, skin-to-skin care has been shown to result in improved autonomic and neurobehavioral maturation, gastrointestinal adaptation, more restful sleep patterns, less crying and better growth" (p. e2). They further elaborated that these results could most likely be

generalized to full-term infants. Skin-to-skin care may offer benefits to mothers with depression associated with unmet exclusive breastfeeding goals and their infants.

Definition of Terms

Unmet Breastfeeding expectations: Mothers who set out to breastfeed in pregnancy or at birth but are unable to meet their breastfeeding goals in terms of exclusivity and/or duration.

Exclusive breastfeeding: The World Health Organization (2016) defines exclusive breastfeeding as providing only breastmilk nutrition to the infant, with the exception of vitamins medicines, minerals, or rehydration solutions.

Mixed (or partial) breastfeeding: The act of providing other solid or liquid nutrition in addition to breastmilk for an infant under 6 months of age (Unicef, n.d.).

Postpartum Depression: Depression that occurs after pregnancy. For two weeks, most of the day, nearly every day the woman experiences: persistent sad, anxious, or "empty" mood; feelings of hopelessness or pessimism; irritability; feelings of guilt, worthlessness, or helplessness; decreased energy or fatigue; difficulty sleeping, early-morning awakening, or oversleeping; loss of interest or pleasure in hobbies and activities; moving or talking more slowly; feeling restless or having trouble sitting still; difficulty concentrating, remembering, or making decisions; appetite and/or weight changes; thoughts of death or suicide, or suicide attempts; and aches or pains, headaches, cramps, or digestive problems without a clear physical cause and/or that do not ease even with treatment (National Institute for Mental Health, n.d.a).

Skin-to-skin care: Skin-to-skin care is the act of putting a healthy term newborn infant ventrally on the mother's/caregiver's bare chest. The infant is wearing only a diaper to promote skin contact between the dyad. The infant is then covered in a blanket with the exception of the head.

Skin-to-skin is recommended immediately after birth for up to one hour and throughout infancy (Feldman-Winter et al., 2016).

Kangaroo care: Kangaroo care is the act of putting a preterm or infant cared for in the NICU newborn infant ventrally on the mother's/caregivers bare chest. The infant is wearing only a diaper to promote skin contact between the dyad. The infant is then covered in a blanket with the exception of the head (Feldman-Winter et al., 2016; WHO, 2003).

*Oxytocin***:** A hypothalamic nonapeptide that is associated with improving well-being, stress responses and social interaction. It is released into the body during labor and delivery, skin-to-skin contact and breastfeeding as a response to somatosensory stimulation (Unväs-Moberg, Handlin, & Petersson, 2015).

*Cortisol***:** A glucocorticoid (steroid hormone) that when measured reflects the level of hypothalamic-pituitary-adrenocortical (HPA) system activity in the body (Neu, Laudenslager & Robinson, 2009).

Edinburgh Postnatal Depression Scale: The most common screening tool used to screen for symptoms of emotional distress within pregnancy and postpartum period is the Edinburgh Postnatal Depression Scale. The EPDS is a checklist completed by the mother that reflects her experiences within the last 7 days in conjunction with a professional interview. A score on the EPDS of 10 or above indicates concern for maternal distress (Cox, Holden, & Sagovsky, 1987).

Supplemental Nursing System: A small tube that is taped to the breast, connected to a bag filled with breastmilk or formula. Allows the mother to feed at breast to supplement infant feedings (Supplemental Nursing System, 2013).

Paced Bottle Feeding: The act of bottle feeding an infant who is held at a 45 degree angle and encouraged to suck about 3 times. Feeder then creates breaks in sucking by tilting the bottle to stop the flow of milk to the infant until the infant begins to suck again (Palmar, 1993).

Purpose of the Study

The purpose of this research is to determine if skin-to-skin care serves as a protective factor and minimizes the symptoms of postpartum depression in mothers with unmet exclusive breastfeeding goals. This research will be done to educate mental health practitioners, lactation counselors and other medical personnel about the importance of recognizing how unmet exclusive breastfeeding goals can impact maternal well-being and ways to promote support for mothers impacted by postpartum depression correlated with unmet exclusive breastfeeding goals. This study will involve a review of current literature on the relationship between unmet exclusive breastfeeding goals, breastfeeding and postpartum depression and the physiological effects on the mother and infant. The impact of skin-to-skin care will be explored with emphasis on how skin-to-skin care may neurobiologically protect maternal mental health and promote positive development of the maternal/infant dyad.

Significance of the Study

There are significant long term benefits of breastfeeding, including protective physical and emotional health factors for infant and parents, environmental, and economic benefits (National Institute for Health, n.d.b). However, some mothers intend to breastfeed but are unable to meet their goals, leaving them in a state of feeling shame, guilt, and loss (Burns et al., 2010, Guyer, Millward, & Berger 2012, Hegney, Fallon & O'Brien, 2008). In fact, researchers have found that mothers who do not reach their exclusive breastfeeding goals are correlated with a greater risk of postpartum depression (Borra et al., 2015; Gregory et al., 2015). Postpartum

depression affects approximately 1 out of every 8 women (Centers for Disease Control and Prevention, 2016). Symptoms include feelings of sadness, anxiety, difficulty with sleep, loss of interest in preferred activities or other people, sometimes to the extent that it interferes with daily living activities (National Institute for Mental Health, n.d.b). Infants of mothers who have postpartum depression are also significantly affected. Tronic and Reck (2009) stated, "Maternal depression—by compromising mothers' emotions—distorts the communication of emotions between infants and others and the distortion of their communication derails the infants' emotional and social development" (p. 147). Gross motor and language outcomes for infants are also impacted (Ali, Mahmud, Khan, & Ali, 2013). Given the magnitude of these long-term effects, it is imperative women are offered strategies to help minimize symptoms. Skin-to-skin care has been identified by the NIH and WHO as a strategy that promotes emotional and physical benefits to both the mother and infant. Skin-to-skin care decreases maternal cortisol (Handlin et al., 2009), improves the production of oxytocin in both mothers and infants (Unväs-Moberg, K., Handlin, L., & Petersson, M., 2015), reduces maternal levels of stress, and increases breastfeeding duration (Moore, E., Bergman, N, Anderson, G. C., & Medley, N., 2016). For infants, the benefits include improved glucose levels (Moore et al., 2016), response and recovery to pain (Johnston et al., 2016), respiration rates (Cho et al., 2016), thermal regulation (Nyqvist et al., 2010), and heart rate regulation (Johnston et al., 2016). The intent of this study is to facilitate the understanding of the relationship between postpartum depression and mothers with unmet breastfeeding goals, as well as how the utilization of skin-to-skin care may improve breastfeeding, physical and emotional outcomes for this subset of mothers and infants.

Delimitations/Limitations of Research

References were obtained through the Online Karrmann Library at the University of Wisconsin-Platteville and the University of Wisconsin-Madison library system from 2006-2017. Google, Google Scholar, EBSCO host, PubMed and Research Gate were also utilized along with other online search engines. Other delimitations are the inclusion of studies focused on women who gave birth (cesarean section or vaginal delivery), women with a diagnosis of postpartum depression and women who engaged in skin-to-skin or kangaroo care with their full or preterm infants. Limitations included lack of research related to the causality in unmet breastfeeding goals and postpartum depression, minimal research related to skin-to-skin practices without breastfeeding, and most research was based on white, middle class women.

Summary

Societal, physical and emotional factors may impact a woman's ability to achieve her breastfeeding goals. The relationship between breastfeeding cessation and depression warrant a more thorough understanding to ensure best practice intervention. Skin-to-skin care may positively influence maternal mood, infant regulation and breastfeeding outcomes. The following chapter will review research examining each of these components and their connections. Recommendations for further study and practice will be discussed in Chapter 3.

Chapter Two: Review of Related Literature

The review of literature began with the influence of exclusive breastfeeding goal attainment on infant and maternal health. It was followed by research findings on reasons why mothers cease breastfeeding and the correlation to postpartum depression. Additionally, a literature review was completed on skin-to-skin care, with emphasis on neuroendocrine and emotional impacts for mothers and infants. The results were organized in a way that demonstrated the progression of mother's breastfeeding intentions to the use of skin-to-skin care as a strategy to modify the impact of postpartum depression: Unmet exclusive breastfeeding goals, societal influences on breastfeeding outcomes, neuroendocrine components of breastfeeding, physiologic explanations of breastfeeding cessation, postpartum depression, mechanisms that contribute to postpartum depression, functional implications of postpartum depression, postpartum depression and breastfeeding, skin-to-skin/kangaroo care history and implementation, physiological benefits of skin-to-skin care and effect of skin-to-skin care on psychological well-being.

Unmet Exclusive Breastfeeding Goals

Exclusive breastfeeding until the infant reaches at least 6 months of age is the gold standard of infant feeding according to the World Health Organization (WHO, 2013b). However, in an analysis of the Infant Feeding Practices Study II, a large scale longitudinal study completed in the United States in 2008, Odom et al. (2013) found that 60% (n=1177) of postpartum women reported they did not breastfeed their babies as long as they had intended. Given the proven benefits of breastfeeding, why are women not achieving their breastfeeding goals? In the first weeks postpartum, the mother is adjusting to hormonal changes, lack of sleep, and role changes which makes this time in a woman's life more challenging, more so than when

the infant is older (Bigelow et al., 2014). Guyer et al. (2012, p. 729) reported that "all mothers, irrespective of their breastfeeding duration, felt disappointed during the early stages of trying to establish breastfeeding because of a major discrepancy that existed between their expectations and lived experiences." Indeed, changes for women in the first weeks postpartum are significant on emotional, social and physical levels.

When a mother ceases breastfeeding before her intended goal, she may experience feelings of guilt, shame and disappointment. The intensity of these feelings and resulting stress can vary for the mother, depending on the importance her culture places on breastfeeding. In a study of the psychological effects of goal attainment, Moberly and Watkins (2010), reported "the combination of low goal success and high goal importance was associated with the highest levels of negative affect, and this interaction was marginally significant for ruminative self-focus" (p. 729). Mothers feel that breastfeeding should be natural task that should be easy to manage and pleasurable. When those expectations go unmet, feelings of disillusionment and sadness result (Guyer et al., 2012; Hegney et al., 2008). Katherine Wisner (2016) discussed how Surgeon General warnings associated with not breastfeeding may create distress for the mother who cannot or who can no longer breastfeed. Indeed, in a qualitative study of 6 British women, Guyer et al. (2012) found mothers who stopped breastfeeding before 6 months felt a sense of guilt about putting their own needs over those of their infants' after they decided to stop breastfeeding and were worried they had put their infant's health at risk as a result. Hegney et al. (2008) reported that feelings of emotional upset, anxiety, or depression impacted maternal duration of breastfeeding, feelings of well-being, and perceptions of success as a mother. Additionally, feelings of failure and guilt were consistency experienced by women (n=40) with unmet breastfeeding goals.

Societal Influences on Breastfeeding Outcomes

Societal influences play a prominent role in how maternal success is defined and the importance of supporting breastfeeding outcomes. For instance, individualistic cultures are associated with decreased breastfeeding goal attainment as the expectation is that mothers return to "normal" (or prior pregnancy status) several days after birth, whereas other more collectivist cultures take pride in taking care of the mother for many months postpartum (Brown, 2015). Indeed, poor social, familial and/or professional support is a significant risk factor for cessation of breastfeeding before 6 months (Kehler et al., 2009; Guyer et al., 2012). There is also a significant relationship between single, divorced, or separated mothers and using formula feedings at 5 months postpartum (Nishioka et al., 2011). A reflection of decreased societal support also includes work and maternity leave standards for mothers. Mothers who are offered at least 12 weeks of paid maternity leave have improved breastfeeding outcomes at 6 months than women who are not offered paid leave (Mirkovic, Perrine, & Scanlon, 2016). Dagher, McGovern, Schold, and Randall (2016) reported mothers who were required to return to work before their baby was 6 months of age versus those who did not return to work had higher rates of breastfeeding cessation. Mothers who have lower levels of education and socioeconomic status often work in clerical or blue collar jobs and struggle to maintain breastfeeding when they return to work as they often lack flexibility in time, pay, or private, sanitary areas to express milk (Nishioka et al., 2011, Dagher et al., 2016). Societal factors, however, are only part of the equation--the physiology of the mother also plays an important role in establishing and maintaining the breastfeeding relationship.

Neurobiological Components of Breastfeeding

To understand how physiology impacts breastfeeding cessation, one must first understand how the hormones oxytocin, prolactin, and cortisol effect lactation. Oxytocin is a released from the posterior pituitary gland in the mother as a result of smell, auditory, touch and/or suckling sensory input (Unväs-Moberg et al., 2015). It stimulates the milk ejection reflex, lowers maternal blood pressure, has analgesic properties, and decreases cortisol levels (Mannel, Martens, & Walker, 2013). Oxytocin is responsible for increasing maternal aggression toward threats as well as decreasing aggression toward offspring (Stuebe et al., 2012). The production of oxytocin is negatively impacted by high levels of stress and anxiety (Stuebe et al., 2012). Prolactin is a hormone that is responsible for milk synthesis (Stuebe et al., 2012). Levels of prolactin increase in pregnancy and just after birth, but then significantly decreases--except during the act of breastfeeding when it increases to two times its typical measure (Stuebe et al., 2012). Cortisol is an essential hormone that is important to lactation, as it binds to prolactin to help with milk production (Stuebe et al., 2012). Cortisol is also a byproduct of the hypothalamus-pituitary-adrenal (HPA) axis activation (Stuebe et al., 2012) produced as a result of stress to the system. Typically, cortisol levels are the highest pre-waking to help the body prepare for the day, and lowest in the evening (Fries, Dettenborn, & Kirschbaum, 2009). Ahn & Corwin (2015) found that mothers who breastfed had decreased rates of pro-inflammatory cytokines IL-6 and increased morning cortisol levels compared to bottle feeding mothers at 6 months postpartum. Cortisol serves a critical function in maintaining homeostasis, but excessive amounts have negative effects on metabolic, cardiovascular, immune, emotional and cognitive functions (Dedovic & Duchesne, 2012). In pregnancy, an increase in placental corticotrophin-releasing hormone (CRH) leads to an increase in cortisol and suppression of hypothalamic CRH

secretion. After birth, the hypothalamic release of CRH gradually resumes a more homeostatic state (Stuebe et al., 2012). When these systems are disrupted, difficulties with breastfeeding often result.

Physiologic Explanations of Breastfeeding Cessation

Considering the number of women who do not breastfeed or have difficulty with breastfeeding, it is surprising to know that there are only a few conditions that are true contraindications to breastfeeding: T-cell lymphotrophic virus type I or II, untreated brucellosis, or in the United States, HIV (American Academy of Pediatrics, 2012). Li, Fein, Chen, and Grummer-Strawn (2008, p. S71) found that mothers who discontinued breastfeeding with in the first month and between the first the second months after birth included "baby had trouble sucking and latching on" (53.7% and 27.1% respectively), "breast milk alone didn't satisfy my baby" (49.7% and 55.6%), and "I didn't have enough milk" (51.7% and 52.2%).

Pain with breastfeeding is frequently cited as a reason for cessation, and is associated with depression due to catastrophizing associations interwoven with central nocioception pathways (Gracely et al., 2004) and decreased oxytocin levels. Diminished oxytocin impacts cortisol levels during lactation, disrupting the HPA axis. The cascade of effects that follow include reduced milk production due to decreased systemic cortisol while the infant is breastfeeding, and reduced effects of stress that is generally associated with breastfeeding secondary to disturbances in prolactin and oxytocin production. These factors may lead to less pleasure in breastfeeding, earlier weaning, and symptoms of postpartum depression (Stuebe et al., 2012). According to Guyer et al. (2012), mothers who had experienced unexpected physical struggles establishing breastfeeding experienced significant distress and frustration. In fact, women who disliked breastfeeding were 1.42 times more likely to have postpartum depression

than mothers who enjoyed breastfeeding 2 months after delivery (Watkins et al., 2011). Because of the impact not only on the mother, but also the infant and the mother/infant relationship, postpartum depression is one of the most disconcerting outcomes of unmet breastfeeding goals.

Postpartum Depression

Postpartum depression affects approximately 1 out of every 8 women (Centers for Disease Control and Prevention, 2016). Symptoms include feelings of sadness, anxiety, difficulty with sleep, loss of interest in preferred activities or other people, to the extent that it interferes with daily living activities (National Institute for Mental Health, n.d.b). Women are twice as affected by postpartum depression as men (WHO, 2016). According to Katherine Wisner (2016), of 826 women, 33.4% were identified as having depression using the Edinburgh Postnatal Depression Scale (EPDS) during pregnancy, 40.1% within 4 weeks of birth and 26.5% prior to pregnancy. Within the peak of their childbearing years, ages 18-44, women are also at the greatest risk (57.0%, n=419), for their first onset of a major depressive episode (Park et al., 2014). Yostrom (2012) reported women with baseline of anxiety and depression were more vulnerable to stress than those without symptoms prenatally or during pregnancy. Given these demographics and the impacts of postpartum depression, it is critical providers understand the underlying contributors to postpartum depression and correlations to breastfeeding cessation in order to provide optimal physiological support and social change for mothers and babies starting before conception.

Mechanisms that Contribute to Postpartum Depression

Just as with lactation cessation, "depression results from a complex interaction of social, psychological and biological factors" (WHO, 2016). For instance, lack of emotional, social and practical support was significantly associated in women with an EPDS score of >9, and

emotional and social support maintained significance in women with an EPDS score of >12 (Eastwood, Jalaludin, Kemp, Phung, & Barnett, 2012). A high level of psychosocial stress has an impact on women's oxytocin production and depressive symptoms, but is not significant in oxytocin and mood/sensitive behavior in women with low levels psychosocial stress (Zelkowitz et al., 2014). Mezzacappa and Endicott (2007) discovered in their study (n=1165) that in multiparas, 36.9% of bottle feeding mothers were diagnosed with postpartum depression versus 12.0% of breastfeeding mothers. Additionally, breastfeeding mothers showed decreased cortisol and heart rates when exposed to a stressor than bottle feeding mothers (Cox et al., 2015).

Stuebe et al. (2012) discussed how data from animal and human clinical experiments pointed to neuroendocrine mechanisms that may have triggered perinatal mood disorders and failed lactation. In pregnancy, an increase in placental corticotrophin-releasing hormone (CRH) leads to an increase in cortisol and suppression of hypothalamic CRH secretion. After birth, the hypothalamic release of CRH gradually resumes a more homeostatic state (Stuebe et al., 2012). The research is conflicted around cortisol levels for women with perinatal mood disorders in pregnancy and postpartum. Some researchers report that cortisol is lower than typical baseline in mothers with postpartum depression, which results in decreased prolactin, oxytocin and cortisol function (Stuebe et al., 2012) and in turn decreases breastfeeding duration. In terms of oxytocin, "both stressors and anxiety are correlated with diminished oxytocin release, which may, in turn affect milk let down and perinatal mood" (Steube, et al., 2012, p. 266). Groer and Morgan (2007) found postpartum depressed mothers had significantly lower salivary cortisol levels. Taylor, Glover, Marks and Kammerer (2009) discovered women with postpartum depression showed significantly decreased morning rise in cortisol levels when compared to postpartum women who did not report depression and women who were not pregnant at 7.5 weeks

postpartum. Though the directional relationship was unclear, Cox et al. (2015) reported their research on oxytocin and HPA reactivity in postpartum women indicated "dysregulation of oxytocin and modulation of cortisol response to stressors may play a role in the pathogenesis of PPD" (p. 9) in women who were breastfeeding. Women in their breastfeeding group who showed signs of depression and anxiety also displayed increased cortisol levels and heart rates compared to women who were asymptomatic. In addition, an increase in cortisol reactivity was noted in pregnant mothers who developed postpartum depression when subjected to stress compared to probable non-depressed pregnant mothers in a study completed by Nierop, Bratsikas, Zimmerman, & Ehlert (2006). Finally, in a typical neurohormone situation, stress (resulting from, but not limited to pain, sleep disturbance or injury) also activates the immune system triggering a release of proinflammatory cytokines based on cortisol production (Kendall-Tackett, 2007). Postpartum depression has been linked with an increase in proinflammatory cytokines (Liu, H., Zhang, Y., Gao, Y., & Zhang, Z., 2016). Mothers in the postpartum period typically experience increased inflammation. However, if there is less cortisol or the mother is cortisol resistant, the system becomes dysregulated -- increasing the likelihood of postpartum depression (Kendall-Tackett, 2007, Kim & Ahn, 2015).

Functional Implications of Postpartum Depression

Postpartum depression can result in acute outcomes for the mother and infant dyad. A multitude of perinatal health concerns are associated with postpartum depression such as: physiological dysregulation, appetite and nutrition effects, cognitive changes that affect attention to self and infant safety, prenatal care compliance, increased alcohol and/or drug use, loss of interpersonal and financial resources, increased morbidity of other medical problems, decreased capacity of maternal attachment behaviors to support infant development, and increased risk of

suicide (Wisner, 2016; WHO, 2016). Tactile, vocal, and facial communication are all effected in depressed mothers, and as a result, infants of depressed mothers, "smile less and frown more, are irritable and difficult to console, and tend to be more withdrawn and less responsive" (Wisner, 2016). Tronick and Reck (2009) described how mothers with postpartum depression were less responsive to their infants, and as a result, those infants were more likely to develop sad, depressed, and angry affects. Such disruptions in psychosocial relatedness may also lead to challenges in infant attachment and long- term wellness. Matijasevich et al. (2015) reported more chronic and severe patterns of maternal depression resulted in increased child externalization and internalization behaviors and probability the child could be diagnosed with a mental health disorder at 6 years of age. When considering best practices to support the mother and infant, the neurobiological and social links between postpartum depression and breastfeeding goal attainment need to be taken into consideration.

Postpartum Depression and Breastfeeding

Current research varies as to whether breastfeeding affects postpartum depression and/or vice versa. A majority of researchers indicate that postpartum depression decreases breastfeeding duration. Dennis and McQueen (2007) reported that breastfeeding cessation could be predicted by early postpartum depressive symptoms. In addition, women with two or more physiological stressors were three times more likely to not exclusively breastfeed to 4 months (Lindau et al., 2015). Kehler et al. (2009) stated depression or anxiety during pregnancy and/or history of depression were significant factors for cessation of breastfeeding before 6 months. Finally, a significant relationship was found between single, divorced, or separated mothers' EPDS scores to >9 at 5 months, which was also a significant determinant of formula milk based feeding at 5 months postpartum (Nishioka et al., 2011).

Additionally, mothers who have postpartum depression and are taking medications for treatment may discontinue breastfeeding out of concern that the medication may transfer through breastmilk to their infants. There is still an inaccurate, generalized belief that antidepressant use needs to be equated with cessation of breastfeeding (Wisner, 2016). This may be because the research on the long term effects of medication use during pregnancy and the postpartum period are contradictory (Kendall-Tackett & Hale, 2010). However, Hale and Rowe (2014) reported that in certain cases, breastfeeding while the mother is taking certain antidepressants may be more beneficial than not breastfeeding at all. A review by Kendall-Tackett and Hale (2010) stated the risk of not treating mothers with postpartum depression was more dangerous than the small amount of medication that may be transferred through breastmilk. They reported there was always risk involved in taking antidepressants while pregnant or breastfeeding as the long term effects are still unknown, though the risks placed on the infant when the mother was taking antidepressants (with the exception of fluoxetine) while breastfeeding were generally low (Kendall-Tackett & Hale, 2010).

Other studies found that the cessation of breastfeeding or initiation of bottle feeding related to postpartum symptoms. Nishioka et al. (2011) stated, "The proportion of mothers who changed the feeding pattern (from breastfeeding-based at 1-month to formula milk-based at 5-month) with EPDS $\geq$ 9 points at 5-month postpartum was significantly higher than those who continued to breastfeed at 1- and 5-month postpartum" (p. 555). Mezzacappa and Endicott (2007) stated that within the sample of multiparas, 36.9% of mothers who were bottle feeding and 12.0% of breastfeeding mothers had significant odds of qualifying as depressed. The difference was not statistically significant for primiparas. Researchers in an evolutionary medicine review suggested women who bottle fed or ceased breastfeeding had higher rates of

postpartum depression as their bodies responded physiologically in a manner similar to mothers who had babies that died (Gallup, Pipitone, Carrone, & Leadholm, 2010).

Exclusive breastfeeding may reduce the risk of depression symptomology. Breastfeeding mothers were significantly less likely to report depressed mood and anhedonia than mixed-or formula feeding mothers (Kendall-Tackett, Cong, & Hale, 2011). Borra et al. (2015) reported the strongest negative relationship between decreased scores on the EPDS and breastfeeding were noted at 8 weeks after birth. Women who were breastfeeding at 1 week were not less likely than non-breastfeeding mothers to report postpartum depression at 1 or 2 months after birth (Dennis & McQueen, 2007; Hahn-Holbrook, Haselton, Dunkel, Schetter, & Glynn, 2013). However, over time, mothers who breastfed reported less depressive symptoms up to 2 years of age (Hahn-Holbrook et al., 2013). Partial breastfeeding and bottle feeding were found to increase anxiety and symptoms of depression (EPDS >10), though bottle feeding was found to pose a more severe risk than mixed breastfeeding (Yostrom, 2012). In addition, Tashakori, Behbahani, & Irani (2012) found a significant difference in the rates of postpartum depression (EPDS ≥12) 8 weeks after delivery in 150 mothers who exclusively breastfed (n=2) versus those who did not (n=14). For mothers who intend to but are not able to breastfeed, societal changes and strategies that reconstruct the emotional and neurobiological components of breastfeeding need to be considered to promote well-being. Skin-to-skin care is one practice that serves protective and restorative properties for both the mother and baby.

Skin-to-skin /Kangaroo care history and implementation

Feldman-Winter et al. (2016) describe skin-to-skin care as the act of putting a healthy term newborn infant ventrally on the mother's/caregiver's bare chest. The infant is wearing only a diaper to promote skin contact between the dyad. The infant is then covered in a blanket with

the exception of the head. Skin-to-skin care originated in Columbia in 1979 by Dr. Edgar Rey and Dr. Hecter Martinez at the Instituto Materno Infantil in Bogota, Colombia. The physicians implemented a skin-to-skin homecare technique as an alternative to the hospital setting that was overcrowded, understaffed, and had high levels of infectious cross contamination. Initially, 0 babies weighing 501-1000g survived after birth with hospital care. After implementation of a home program that involved skin-to-skin care, positioning the baby in a head-up position, and breastfeeding (with the exception only of providing guava juice), the mortality rate decreased to 75%. In addition, the rate of abandonment dropped from 34 to 10 on a yearly basis (Whitelaw, & Sleath, 1985). Skin-to-skin care or kangaroo care (the later will be used as a description of skin-to-skin for preterm infants for the purposes of this report) has since been well researched and is currently recommended by the National Institute for Mental Health (n.d.c) and the World Health Organization (2003) because of the physical and emotional benefits gained for the mother and the infant born either vaginal or cesarean delivery. Though one of the goals of skin-to-skin care is to improve breastfeeding outcomes, it is recommended regardless of feeding style. Current literature varies or does not always clarify how much skin-to-skin is necessary to produce optimal results. In one review, skin-to-skin is recommended immediately after birth for up to one hour and throughout infancy (Feldman-Winter et al., 2016). Chan, Valsangkar, Kajeepeta, Boundy, and Wall (2016) found that in a review of the literature, the most common duration of skin-to-skin reported in studies was 22 hours, and that it is necessary to continue to study how much skin-to-skin care produces the maximum results in a way that may be most reasonable for families. The World Health Organization (2003) recommended the following guidelines on the implementation of skin-to-skin care: initiate immediately after birth, maintain

each session for a minimum of 60 minutes or more (as to minimize the frequency of disrupting the physiological state), and continue to implement skin-to-skin care until the infant refuses.

Implementation of skin-to-skin care encourages positive interactions between mothers and babies to establish breastfeeding and potentially dampen symptoms of postpartum depression. In industrialized countries, it is common birth practice to separate the mother from a full-term infant immediately after birth to clean, weigh, and administer vitamins. For premature infants, or those at risk, the separation can be much longer (as in the case of early preterm infants in incubators). These examples of early and frequent separation of the mother and the infant increases the stress load through repeated activation of the HPA axis, which can lead to both short and long-term effects on mental health (Vetulani, 2013). In his work with rat pups, Vetulani (2013) found that repeated 3-hour separation of the pups from the dams from birth resulted in hyper responsivity and lifelong depressive-like symptoms—and were similar in findings of human maternal separation from infants. Given that it is not always common practice in hospitals for the infant to "room in" with the mother, the neurobiological effects on human infants that are separated at birth without ever having contact with their mother may be even more significant on the dyad. Tactile, skin-to-skin input between the rat pups and dams, however, enhances hypothalamic oxytocin, reducing stress (Vetulani, 2013).

Physiological Benefits of Skin-to-skin care

Skin-to-skin care results in physiological benefits for the mother and infant. Nimbalkar, Patel, Sethl, and Nimbalkar (2014) found that during skin-to-skin care there was a significant decrease in maternal blood pressure and respiratory rate when compared to resting rates. Mothers overall reported less anxiety, felt more relaxed, and demonstrated improved breastfeeding rates in early post-partum (Moore, Anderson, Bergman, & Dowswell, 2012). A

small (n=18) qualitative study by Johnson (2007) reported that mothers who engaged in kangaroo care felt they were more connected to their infants, better able to read their infant's cues and gained confidence in their maternal roles. Moore et al., (2012) in their large-scale research analysis found that that late preterm infants who participated in skin-to-skin care cried less, were more interactive with caregivers, and had more stabilized blood glucose concentrations. In addition, skin-to-skin care improved infant respiration rates (Cho et al., 2016), thermal regulation (Nyqvist et al., 2010), and had analgesic effects (Johnston et al., 2016). Okan, Ozdil, Bulbul, Yapici, and Nuhoglu (2010) found no differences between skin-to-skin care and breastfeeding groups in terms of neonates who were subjected to a heel prick in terms of heart rate, oxygen saturation changes and length of crying, but results were significantly improved when compared to infants who were placed on a table for the procedure.

Skin-to-skin care has been shown to increase the duration of time mothers engaged in breastfeeding (Bigelow, et al., 2014; Moore et al., 2012). The World Health Organization (2003) reported that the earlier that breastfeeding is initiated, the greater the breastfeeding outcomes. Bigelow et al. (2014) found in their study that all of the mothers who engaged in skin-to-skin care were still breastfeeding at 3 months, whereas the control group's breastfeeding rates decreased as their infants aged. Skin-to-skin care, because of the tactile stimulation and in turn oxytocin release, may stimulate milk production, increasing the "likelihood of mothers maintaining their decision to breastfeed their infants" (Bigelow, et al., 2014, p. 60). In addition, a more significant decrease in cortisol levels was evident the longer mothers participated in skin-to-skin care with their infants prior to sucking (Handlin et al., 2009).

Other studies have also reported on the benefits of skin-to-skin care on oxytocin levels in the mother and infant. For instance, when parents engage in skin-to-skin care, "parental cortisol

and anxiety responses corresponded to the OT changes at pre-, during- and post-SSC stages suggests that OT release in response to SSC may modulate the autonomic nervous and stress-regulation systems and buffer parental responses to stressors and anxiety" (Cong et al., 2015, p. 405). In the same study, maternal oxytocin levels increased from baseline while participating in skin-to-skin with their infants, and decreased after skin-to-skin practice was completed. In a study done on co-regulation of maternal depression and child oxytocin responses, Pratt et al. (2015) found increased maternal oxytocin levels protected children ages birth to 6 years from the effects of depression. Unväs-Moberg et al. (2015) suggested that these long-term benefits of early skin-to-skin care and oxytocin release may lead to a conditioned response where a child hearing, seeing, or smelling the mother may lead to an oxytocin response. In turn, the child is neurobiologically primed to establish a positive attachment response to the mother.

Mörelius et al. (2015) reported HPA axis and brain maturation may be affected by consistent human touch and parental closeness by the influence of regulation of circadian rhythms and cortisol. Neu et al. (2009) found that after 60 minutes of holding (both skin-to-skin and "traditionally" with a blanket) mothers and infants co-regulated their salivary cortisol levels—in other words, their cortisol levels were more closely matched after holding when compared to their baseline levels of cortisol. Further, cortisol assay differences between one week and one month indicated a significant decrease in cortisol (stress) levels in mothers who practiced skin-to-skin care than the control group of mothers who were not requested to provide skin-to-skin care (Bigelow et al., 2012). Mörelius et al. (2015) found salivary cortisol reactivity of mothers were significantly decreased when compared to a group of mothers not educated on skin-to-skin care. For mothers experiencing stress related to breastfeeding and/or postpartum depression, it is important to remember that "depressive symptomatology and elevated physiological stress may

be independent risk factors for women in the postpartum period. Yet both may be affected by SSC" (Bigelow et al., 2012, p. 371).

Effect of Skin-to-skin on psychological well-being

In a literature review, Nyqvist et al. (2010) reported that skin-to-skin care aided in decreasing postpartum depression and improved maternal sensitivity. Bigelow et al. (2012) also described how mothers who practiced skin-to-skin care reported fewer depressive symptoms on EPDS scores obtained at one week and one month after giving birth. In a randomized trial of families with fathers and mothers participating in continuous kangaroo care, the father's opinion of stress in the relationship improved (Nimbalkar et al., 2014). This is especially important considering that a protective factor for postpartum depression and early breastfeeding cessation is spousal support. Bystrova et al. (2009) studied 124 mothers and infants who at birth were divided into 4 randomly assigned groups (skin-to-skin and rooming in, dressed infants and rooming in, infants in nursery and mothers in maternity ward, and infants kept in the nursery after birth, but then roomed in with their mothers in the maternity ward) and videotaped 1 year after birth using the Parent Child-Early Relational Assessment (PCERA). Researchers found significant positive effects at one year of age on PCERA measurements of maternal sensitivity, infant self -regulation and irritability and mutuality in the dyad in mothers and infants who participated in 2 hours of skin-to-skin care after birth or early suckling versus mothers who did not have early contact with their infants. Cho et al. (2016) found a significant decrease in maternal stress and improved maternal-infant attachment as a result of kangaroo care.

Chapter Summary

Understanding the physiological and emotional connection between unmet breastfeeding goals and postpartum depression is imperative when considering therapeutic interventions that

enhance maternal and infant health and well-being. Encouraging skin-to-skin practices at birth and continuing into infancy may serve as a no cost, protective strategy toward improved breastfeeding outcomes from the beginning of life, and may decrease symptoms of postpartum depression. For mothers who do not meet their breastfeeding expectations, skin-to-skin care provides the dyad with oxytocin, which may encourage maternal sensitivity, reduce stress, and complement other therapeutic interventions to minimize postpartum depression symptomology.

Chapter Three: Conclusions and Recommendations

This paper reviewed the neurobiological, psychological and psychosocial reasons as to why mothers may discontinue breastfeeding before they desire, how the complex combination of these factors are correlated with postpartum depression, and the effects of skin-to-skin care in improving maternal and infant well-being. The exploration of available research yielded the need for additional study in all of the aforementioned areas. It also indicated the necessity for change in social and individualized maternal care practices.

This review of existing literature leads to the conclusion that the relationship between breastfeeding cessation and postpartum depression is multidirectional. Mothers who have less social support, education, and decreased economic resources are less likely to breastfeed to their intended goals and are also at higher risk for postpartum depression. Physiologically, for mothers under stress, variances in inflammation and cortisol production impact milk production and ejection leading to earlier cessation and depression symptoms. Though research that specifically links the benefits of skin-to-skin care to mothers with unmet breastfeeding goals is not available, there is evidence for the influence of skin-to-skin on physiological states and mood. Bigelow, et al. (2012) stated, "Mother/infant SSC may be an intervention strategy to lessen depressive symptoms and anxiety, improve maternal mood, and assist the psychophysiological connection between mothers and infants, thereby enriching the lives of mothers and their children" (p. 380).

Continued research is necessary to determine the relationship between unmet breastfeeding goals and postpartum depression. Much of the research that relates to the combination of these criteria is based on samples of white, middle class women. In cultures

where breastfeeding is more normative, stress resulting from unmet goals may be more significant and need to be taken into consideration. Additionally, to date research does not indicate how mothers who are unable to breastfeed may benefit from using skin-to-skin and supportive feeding techniques. The duration, intensity and frequency of skin-to-skin care necessary to produce beneficial outcomes in mothers who are not breastfeeding and/or who have postpartum depression needs to be considered in order to provide the most effective means of intervention.

It is recommended that to best address the concerns of mothers with unmet exclusive breastfeeding goals, a shift in focus toward prevention strategies is necessary for mothers who intend to breastfeed. These changes need to occur at the levels of societal change, pregnancy/ birth practices, and postpartum support.

It is imperative that advocates for infants and mothers promote a societal shift toward making improvements in birthing practices, breastfeeding support, and maternal/infant mental health. Debevec & Evanson (2016) explained, "Without realistic expectations, women are unprepared for breastfeeding" (p. 469). The idea that breastfeeding is 'natural' and therefore 'easy' needs to be debunked. We need to better prepare mothers not only of the benefits, but also for the difficulties that are involved with breastfeeding. Breastfeeding mothers are often times devalued in the community or within their own families. Given the rise in popularity of formula feeding post World War II, most women of childbearing age and the generations prior did not have mothers who breastfed. As a result, there is generally a lack of familiar breastfeeding support and vicarious learning. In fact, Porta et al. (2016) found that 56.4% of women who were not breastfed as infants established breastfeeding within the first month versus 91.1% of women who themselves were breastfed. Mothers and their primary supports would

benefit from more peer to peer learning opportunities and built in lactation and mental health support in pregnancy, after delivery and through the first postpartum months as breastfeeding and the maternal/infant relationship is established. Twelve month paid maternity leave as an employment standard would also offer mothers the time and flexibility necessary to establish breastfeeding with less pressure to return to work for economic reasons. Further, the way our society describes 'successful' breastfeeding or 'failed' lactation respectively correlates with how women may define themselves as mothers and is reflected in the guilt and shame mothers experience when they don't meet their goals. We need to mindful of how we define positive mothering and the benefits of supportive bottle and breastfeeding. For example, encouraging bottle feeding techniques that closely mimic breastfeeding could be beneficial to the mother and infant. Strategies such as using a SMS feeder may be an option for donated breastmilk or formula to be fed to the baby via the breast. Holding the baby skin-to-skin, switching sides and promoting paced bottle feeding could offer mothers a way to encourage positive feeding rituals that may offer some similar physiological and emotional effects of breastfeeding. The benefits of partial breastfeeding and using the breast as a calming mechanism for the infant should also be emphasized. Mothers and infants using these feeding approaches might experience gains in mood and physiologic regulation from effects of oxytocin and positive interaction.

Skin-to-skin care should be encouraged as part of the education around standard birthing practices for medical professionals and parents, regardless of feeding choice. Vetulani (2013) hypothesized that the common practice of removing infants from their mothers after birth (to weigh, administer vitamins, etc.) and/or the practice of separating mothers and babies to nursery care wards may be related to our struggles in mental health of industrialized societies as a whole. Separation sets regulatory baselines at a state of heightened alertness, thereby influencing long

term emotional stability, whereas skin-to-skin care promotes physiologic and psychological organization.

It is critical that mental health therapists, obstetricians, pediatricians, lactation consultants and other related medical professionals are educated on how to identify and screen for postpartum depression as early identification and proper referrals can be integral in preserving the health of the mother, infant, and breastfeeding outcomes. In addition, training on the use of skin-to-skin care, the importance rooming in, and appropriate use of antidepressants that are conducive to breastfeeding is essential. Encouraging mothers to establish a relationship with a lactation professional or peer-to-peer support (such as La Leche League) *before* they report challeges with breastfeeding, should be promoted to aid in their breastfeeding goal attainment. In conclusion, establishing early skin-to-skin care, breastfeeding and positive feeding support for all mothers, may reduce the incidence of postpartum depression symptoms related to unmet breastfeeding goals.

References

Ahn, S., & Corwin, E. J. (2015). The association between breastfeeding, the stress response, inflammation, and postpartum depression during the postpartum period: Prospective cohort study. *International Journal of Nursing Studies, 52*(10), 1582-1590. doi: https://doi.org/10.1016/j.ijnurstu.2015.05.017

Ali, N. S., Mahmud, S., Khan, A., & Ali, B. S. (2013). Impact of postpartum anxiety and depression on child's mental development from two peri-urban communities of Karachi, Pakistan: a quasi-experimental study. *BMC Psychiatry,13*(274), 1-12. Retrieved from http://www.biomedcentral.com/1471-244X/13/274

American Academy of Pediatrics. (2012). Policy statement: Breastfeeding and the use of human milk. *Pediatrics, 129*(3), e827-e841. Retrieved from http://pediatrics.aappublications.org/content/pediatrics/129/3/e827.full.pdf

Bigelow, A., Power, M., Gillis, D. E., Maclellan-Peters, J., Alex, M., & McDonald, C. (2012). Effect of mother/infant skin –to-skin contact on postpartum depressive symptoms and maternal physiological stress. *Journal of Obstetric, Gynecologic & Neonatal Nursing, 41,* 369-382. doi: 10.1111/j.1552-690.2012.01350.x

Bigelow, A., Power, M., Gillis, D. E., Maclellan-Peters, J., Alex, M., & McDonald, C. (2014). Breastfeeding, skin-to-skin contact, and mother-infant interactions over infants' first three months. *Infant Mental Health Journal, 35*(1), 51-62. doi: 10.1002/imj.21424

Borra, C., Iacovou, M., & Sevilla, A. (2015). New evidence on breastfeeding and postpartum depression: The importance of understanding women's intentions. *Maternal and Child Health Journal, 19*(4), 897-907. doi: 10.1007/s10995-014-1591-z

Brown, A. (2015). Breast is best, but not in my back-yard. *Trends in Molecular Medicine, 21*(2), 57-59. doi: https://doi.org/10.1016/j.molmed.2014.11.006

Burns, E., Schmied, V., Sheehan, A., Fenwick, J. (2010**).** A meta-ethnographic synthesis of women's experience of breastfeeding. *Maternal and Child Nutrition, 6,* 201-219. doi: 10.1111/j.1740-8709.2009.00209.

Bystrova, K., Ivanova, V., Edhborg, M., Matthiesen, A-S., Rasjö-Arvidson, A-B., Mukhamedrakhimov, R.,…Widström, A-M. (2009). Early contact versus separation: Effects on mother-infant interaction one year later. *Birth, 36*(2), 97-109.

Centers for Disease Control and Prevention. (2008, August 18). *Depression among women.* Retrieved from http://www.cdc.gov/reproductivehealth/Depression/index.htm

Centers for Disease Control and Prevention. (2016). *Infant Feeding Practices Study II* [Table 3.35]. Retrieved from http://www.cdc.gov/breastfeeding/data/ifps/results/ch3/table3-35.htm

Chan, G. J., Valsangkar, B., Kajeepeta, S., Boundy, E. O., & Wall, S. (2016). What is kangaroo mother care? Systematic review of the literature. *Journal of Global Health*, *6*(1), 1-9. doi: http://doi.org/10.7189/jogh.06.010701

Cho, E. S., Kim, S. J., Kwon, M. S., Cho, H., Kim, E., Jun, E. M., & Lee, S. (2016). The effects of kangaroo care in the neonatal intensive care unit on the physiological functions of preterm infants, maternal-infant attachment, and maternal stress. *Journal of Pediatric Nursing, 31*, 430-438. doi: Http://dx.doi.org/10.1016/j.pedn2016.02.007

Chowdhury, R., Sinha, B., Sankar, M. J., Taneja, S., Bhandari, N., Rollins, N,…Martines, J. (2015). Breastfeeding and maternal health outcomes: A systematic review and meta-analysis. *Acta Paediatrica, 104*, 96-113. doi: 10.1111/apa.13102

Cong, X., Ludington-Hoe, S. M., Hussain, N., Cusson, R., Walsh, S., Vazquez, V.,…Vittner, D. (2015). Parental oxytocin responses during skin-to-skin contact in pre-term infants. *Early Human Development, 91*, 401-406. doi:http://dxdoi.org/10.1016/j.earlyhumdev.2015.04.012

Cox, E. Q., Stuebe, A., Pearson, B., Grewen, K., Rubinow, D., & Meltzer-Brody, S. (2015). Oxytocin and HPA stress axis reactivity in postpartum women. *Psychoneuroendocrinology, 55*, 164–172. doi:http://doi.org/10.1016/j.psyneuen.2015.02.009

Cox, J. L., Holden, J. M., & Sagovsky, R. (1987). Development of the 10-item Edinburgh Postnatal Depression Scale. *The British Journal of Psychiatry, 150*(6), 782-786. doi:10.1192/bjp.150.6.782

Dagher R. K., McGovern P. M., Schold J. D., & Randall X. J. (2016). Determinants of breastfeeding initiation and cessation among employed mothers: a prospective cohort study. *BMC Pregnancy Childbirth, 16* (194), 1-11. doi:10.1186/s12884-016-0965-1

Debevec, A. D., & Evanson, T. A. (2016). Improving breastfeeding support by understanding women's perspectives and emotional experiences of breastfeeding. *Nursing for Women's Health, 20*(5), 464-474. doi:http:/dx.doiorg.ezproxylbrary.wsc.edu/10.1016/j.nwh.2016.08.008

Dedovic, K., & Ducesne, A. (2012). Cortisol: Physiology, regulation and health implications. In Esposito, V & Bianchi, W., *Human anatomy and physiology: Cortisol: Physiology, regulation and health implications* (28). New York, NY: Nova. Retrieved from http://www.ebrary.com

Dennis, C-L., & McQueen, K. (2007). Does maternal postpartum depressive symptomatology influence infant feeding outcomes? *Acta Paediatrica, 96*(4), 590-594. doi:10.1111/j.1651-2227.2007.00184.x

Eastwood, J. G., Jalaludin, B. B., Kemp, L. A., Phung, H. N., & Barnett, B. E.W. (2012). Relationship of postnatal depressive symptoms to infant temperament, maternal expectations, social support and other potential risk factors: Findings from a large Australian cross-sectional study. *BMC Pregnancy and Childbirth, 12*(148), 1-11. doi:10.1186/1471-2393-12-148

Feldman-Winter, L., Goldsmith, J. P., Committee on Fetus and Newborn, & Task Force on Sudden Death Syndrome. (2016). Safe sleep and skin-to-skin care in the neonatal period for healthy term newborns. *Pediatrics, 138*(3), e1-e10. doi: 10.1542/peds.2016-1889

Fries, E., Dettenborn, L., & Kirschbaum, C. (2009). The cortisol awakening response (CAR): Facts and future directions. *International Journal Of Psychophysiology, 72*, 67-73. doi: 10.1016/j.ijpsycho.2008.03.014

Gallup, G. G. Jr., Pipitone, R. N., Carrone, K. J., & Leadholm, K. L. (2010). Bottle feeding simulates child loss: Postpartum depression and evolutionary medicine. *Medical Hypotheses, 74(*1*),* 174–176. doi:10.1016/j.mehy.2009.07.016

Gregory E. F., Butz, A. M., Ghazarian, S. R., Gross, S. M., & Johnson, S. B. (2015). Are Unmet Breastfeeding Expectations Associated With Maternal Depressive Symptoms? *Academic Pediatrics, 15*(3), 319-325.

Guyer, J., Millward, L. J., & Berger, I. (2012). Mother' breastfeeding experiences and implications for professionals. *British Journal of Midwifery, 20*(10), 724-733.

Groer, M.W., & Morgan, K. (2007). Immune, health and endocrine characteristics of depressed postpartum mothers. *Psychoneuroendocrinology, 32*(2), 133–139.

Gracely, R. H., Geisser, M. E., Giesecke, T., Grant, M. A. B., Petzke, F., Williams, D.A., & Clauw, D. J. (2004). Pain catastrophizing and neural responses to pain among persons with fibromyalgia. *Brain, 127,* 835-843. doi:10.1093/brain/awh098

Hahn-Holbrook, J., Haselton, M. G., Dunkel, Schetter, C., & Glynn, L. M. (2013). Does breastfeeding offer protection against maternal depressive symptomatology?: A prospective study from pregnancy to 2 years after birth. *Archives of Women's Mental Health, 16*(5), 411-422. doi: 10.1007/s00737-013-0348-9

Hale, T. W., & Rowe, H. (2014). *Medications and mothers' milk (16th ed.).* Plano, TX:Hale Pubishing.

Handlin, L., Jonas, W., Petersson, M., Ejdeback, M., Ransjo-Arvidson, A. B.,…Uvnäs-Moberg, K. (2009). Effects of sucking and skin-to-skin contact on maternal ACTH and cortisol levels during the second day postpartum-influence of epidural analgesia and oxytocin in the perinatal period. *Breastfeeding Medicine, 4*(4), 207-220.

Hegney, D., Fallon, T., & O'Brien, M. L. (2008). Against all odds: A retrospective case-controlled study of women who experienced extraordinary breastfeeding problems. *Journal of Clinical Nursing, 17*(9), 1182-1192. doi: 10.1111/j.1365-2702.2008.02300.x

Johnson, A. N. (2007). The Maternal Experience of Kangaroo Holding. *Journal of Obstetric, Gynecologic, & Neonatal Nursing, 36,* 568–573. doi:10.1111/j.1552-6909.2007.00187.x

Johnston, C, Campbell-Yeo, M., Disher, T., Benoit, B., Fernandes, A., Streiner, D.,… & Zee, R. (2016). Skin–to-skin care for procedural pain in neonates. *Cochrane Database of Systematic Reviews, 1,* eCD008435. Retrieved from https://www.nichd.nih.gov/cochrane_data/johnstonc_01/johnstonc_01.html

Kehler, H. L., Chaput, K. H., Tough, S. C. (2009). Risk factors for cessation of breastfeeding prior to six months postpartum among a community sample of women in Calgary, Alberta. *Canadian Journal of Public Health, 100*(5), 376-380. Retrieved from https://www.researchgate.net/publication/40481627_Risk_factors_for_cessation_of_breastfeeding_prior_to_six_months_postpartum_among_a_community_sample_of_women_in_Calgary_Alberta

Kendall-Tackett, K. A. (2007). A new paradigm for depression in new mothers: The central role of inflammation and how breastfeeding and anti-inflammatory treatments protect maternal mental health. *International Breastfeeding Journal, 2(*6), 1-14. doi:10.1186/1746-4358:2-6

Kendall-Tackett, K. A., Cong, Z., & Hale, T. W. (2011). The effect of feeding method on sleep duration, maternal well-being and postpartum depression. *Clinical Lactation, 2-2*, 22-26. Retrieved from www.ClinicalLactation.org

Kendall-Tackett, K. A., & Hale, T. W. (2010). The use of antidepressants in pregnant and breastfeeding women: A review of recent studies. *Journal of Human Lactation, 26*(2), 17-196. doi: 10.1177/0890334409342071

Kim, Y., & Ahn, S. (2015). A review of postpartum depression: Focused on psychoneuroimmunological interaction. *Korean Journal of Women's Health Nursing, 21*(2), 106-114.

Li, R., Fein, S. B., Chen, J., & Grummer-Strawn, L. M. (2008). Why mothers stop breastfeeding: Mothers' self-reported reasons for stopping during the first year. *Pediatrics, 122,* S69-S76. doi: 10.1542/peds.2008-1315i

Liu, H., Zhang, Y., Gao, Y., & Zhang, Z. (2016). Elevated levels of Hs-CRP and IL-6 after delivery are associated with depression during the 6 months post partum. *Psychiatry Research, 243,* 43-48. doi: https://doi.org/10.1016/j.psychres.2016.02.022

Lindau, J. F., Mastroeni, S., Gaddini, A., Di Lallo, D., Nastro, P. F., Patane, M.,…Fortes, C. (2015). Determinants of exclusive breastfeeding cessation: Identifying an "at risk population" for special support. *European Journal of Pediatrics, 174,* 533-540. doi:10.1007/s00431-014-2428-x

Matijasevich, A., Murray, J., Cooper, P. J., Anselmi, L., Barros, A. J. D., Barros, F C. F, & Santos, I. S. (2015). Trajectories of maternal depression and offspring psychopathology at 6 years: 2004 Pelotas cohort study. *Journal of Affective Disorders, 174,* 424-431. https://doi.org/10.1016/j.jad.2014.12.012

Mannel, R., Martens, P. J., & Walker, M. (2013). *Core curriculum for lactation consultant practice* (3rd ed.). Burlington, MA: Jones & Bartlett Learning.

Mezzacappa, E. S., & Endicott, J. (2007). Parity mediates the association between infant feeding method and maternal depressive symptoms in the postpartum. *Archives of Women's Mental Health, 10,* 259-266. doi:10.1007/s00737-007-0207-7

Mirkovic, K. R, Perrine, C. G., & Scanlon, K. S. (2016). Paid maternity leave and breastfeeding outcomes. *Birth, 43*(3), 233-239. doi: 10.1111/birt.12230

Moberly, N. J., & Watkins, E. R. (2010). Negative affect and ruminative self-focus during everyday goal pursuit. *Cognition and Emotion, 24*(4), 729-739. doi:10.1080/02699930802696849

Mörelius, E., Örtenstrand A., Theodorsson, E., & Frostell, A. (2015). A randomized trials of continuous skin-to-skin contact after preterm birth and the effects on salivary cortisol, parental stress, depression, and breastfeeding. *Early Human Development, 91,* 63-70. http://dx.doiorg/10.1016/j.earlhmandev.2014.12.005

Moore, E. R., Bergman, N., Anderson, G. C., & Medley, N. (2016). Early skin-to-skin contact for mothers and their healthy newborn infants. *Cochrane Database of Systematic Reviews, 11,* 1-163. doi: 10.1002/14651858.CD003519.pub4.

Moore, E.R., Anderson, G. C., Bergman, N., & Dowswell, T. (2012). Early skin-to-skin contact for mothers and their healthy /newborn. *Cochrane Database of Systematic Reviews, 5*. doi:10.1002/14651858.CD003519.pub3.

National Institute for Mental Health. (n.d.a). *Depression in women: 5 things you should know.* Retrieved from https://www.nimh.nih.gov/health/publications/depression-in-women-tr-16-4779/index.shtml

National Institute for Mental Health. (n.d.b). *Postpartum depression facts.* Retrieved from: https://www.nimh.nih.gov/health/publications/postpartum-depression-facts/index.shtml

National Institute for Mental Health. (n.d.c). *What are the benefits of breastfeeding?* Retrieved from https://www.nichd.nih.gov/health/topics/breastfeeding/conditioninfo/Pages/benefits.aspx#f2

Neu, M., Laudenslager, M. L, & Robinson, J. (2009). Coregulation in salivary cortisol during maternal holding of premature infants. *Biological Research for Nursing, 10*(3), 226-240. doi:10.1177/1099800408327789

Nierop, A., Bratsikas, A., Zimmerman, R, & Ehlert, U. (2006). Are stress-induced cortisol changes durng pregnancy associated with postpartum depressive symptoms? *Psychosomatic Medicine, 68*(6), 931-937. doi: 10.1097/01.psy.0000244385.93141.3b

Nimbalkar, A., Patel, D., Sethi, A., & Nimbalkar, S. (2014). Effect of skin-to-skin care to neonates on pulse rate, respiratory rate, SPO_2 and blood pressure in mothers. *Indian Journal of Physiology and Pharmacology*, *58*(2), 174-177.

Nishioka, E., Haruna, M., Ota, E, Matsuzaki, M, Murayama, R., Yoshimura, K., & Murashima, S. (2011). A prospective study of the relationship between breastfeeding and postpartum depressive symptoms appearing at 1-5 months after delivery. *Journal of Affective Disorders*, *133*(3), 553-559.

Nyqvist, K.H., Anderson, G. C., Bergman, N., Cattaneo, A., Charpak, N., Davanzo, R.,…Widström, A. M. (2010). Towards universal kangaroo mother care: Recommendations and report from the first European conference and seventh international workshop on kangaroo mother care. *Acta Paediatrica, 99*, 820-826.

Odom, E. C., Li, R., Scanlon, K. S., Perrine, C. G., & Grummer-Strawn, L. (2013). Reasons for Earlier Than Desired Cessation of Breastfeeding. *Pediatrics*, *131*(3), e726–e732.

Okan, F., Ozdil, A., Bulbul, A., Yapici, Z., & Nuhoglu, A. (2010). Analgesic effects of skin-to-skin contact and breastfeeding in procedural pain in healthy term neonates. *Annals Of Tropical Paediatrics, 30*(2), 119-128. doi:10.1179/146532810X12703902516121

Office of Disease Prevention and Health Promotion. (2010). Maternal, infant and child health: Infant care. In *Healthy People 2020* (Maternal, infant and child health objectives). Retrieved from https://www.healthypeople.gov/2020/topics-objectives/topic/maternal-infant-and-child-health/objectives

Palmer, M. M. (1993). Identification and management of the transitional suck pattern in premature infants. *Journal of Perinatal and Neonatal Nurs*ing, *7*(1), 66–75.

Park, S. C., Hahn, S. W., Hwang, T. Y., Kim, J. M., Jun, T.Y., Lee, M. S.,…Park, Y. C. (2014). Does age at onset of first major depressive episode indicate the subtype of major depressive disorder?: The clinical research center for depression study. *Yonsei Medical Journal, 55*(6), 1712-1720. https://doi.org/10.3349/ymj.2014.55.6.1712

Porta, F., Mussa, A, Baldassarre, G., Perduca, V., Farina, D., Spada, M., & Ponzone, A. (2016). Genealogy of breastfeeding. *European Journal of Pediatrics, 175*, 105-112. doi:10.1007/s00431-015-2605-6

Stuebe, A., Grewen, K., Pedersen, C. A., Propper, C., & Meltzer-Brody, S. (2012). Failed lactation and perinatal depression: Common problems with shared neuroendocrine mechanisms? *Journal of Women's Health, 21*(3), 264-272. doi:10.1089/jwh.2011.3083

Supplemental nursing system. (2013). In *Wikipedia, The Free Encyclopedia*. Retrieved June 27, 2017 from https://en.wikipedia.org/w/index.php?title=Supplemental_nursing_system&oldid=559077392

Tashakori, A., Behbahani, A. Z., & Irani, R. D. (2012). Comparison of prevalence of postpartum depression symptoms between breastfeeding mothers and non-breastfeeding mothers. *Iranian Journal of Psychiatry, 7*(2), 61–65.

Taylor, A., Glover, V., Marks, M., & Kammerer, M. (2009). Diurnal pattern of cortisol output in postnatal depression. *Psychoneuroendocrinology, 34*(8), 1184-1188.

Tharner, A., Luijk, M. P.C. M., Raat, H., Ijzendoorn, M. H., Bakermans-Kranenburg, M. J., Moll, H. A.,…Tiemeier, H. (2012). Breastfeeding and its relation to maternal sensitivity and infant attachment. *Journal of Developmental & Behavioral Pediatrics, 33*(5), 396-404. doi: 10.1097/DBP.0b013e318257fac3

Tronick, E., & Reck, C. (2009). Infants of depressed mothers. *Harvard Review of Psychiatry, 17*, 147-156. doi: 10.1080/10673220902899714

UNICEF. (n.d). *Breastfeeding*. Retrieved from http://www.unicef.org/nutrition/index_24824.html

United States Department of Health and Human Services (2011). *The surgeon general's call to action to support breastfeeding*. Retrieved from http://www.surgeongeneral.gov/library/calls/breastfeeding/calltoactiontosupportbreastfeeding.pdf

Unväs-Moberg, K., Handlin, L., & Petersson, M. (2015). Self-soothing behaviors with particular reference to oxytocin release induced by non-noxious sensory stimulation. *Frontiers in Psychology, 12*. http://dx.doi.org/10.3389/fpsyg.2014.01529

Vetulani, J. (2013). Early maternal separation: A rodent model of depression and a prevailing human condition. *Pharmacological reports, 65,* 1451-1461.

Watkins, S., Meltzer-Brody, S., Zolnoun, D., & Stuebe, A. (2011). Early breastfeeding experiences and postpartum depression. *Obstetrics and Gynecology, 118*(2), 214-221. doi:10.1097/AOG.0b013e3182260a2d

Whitelaw A., & Sleath K. (1985). Myth of the marsupial mother: Home care of very low birth weight babies in Bogota, Colombia. *Lancet, I,* 1206-1208.

Wisner, K. L. (2016). *Postpartum mood disorders*. [Powerpoint slides].

Woolhouse, H., James, J., Gartland, D., McDonald, E., & Brown, S. J. (2016). Maternal depressive symptoms at three months postpartum and breastfeeding rates at six months postpartum: Implications for primary care in a prospective cohort study of primiparous women in Australia. *Women and Birth, 29*, 381-387. http://dx.doi.org/10.1016/j.wombi.2016.05.008

World Health Organization [WHO]. (2003). *Kangaroo mother care: A practical guide.* Retrieved from http://apps.who.int/iris/bitstream/10665/42587/1/9241590351.pdf

World Health Organization [WHO]. (2013a). *Essential nutrition actions: Improving maternal, newborn, infant and young child health and nutrition.* Retrieved from http://apps.who.int/iris/bitstream/10665/84409/1/9789241505550_eng.pdf

World Health Organization [WHO]. (2013b , August 24). *Exclusive breastfeeding.* Retrieved from http://www.who.int/elena/titles/exclusive_breastfeeding/en/

World Health Organization [WHO]. (2016, April). *Depression.* Retrieved from http://www.who.int/mediacentre/factsheets/fs369/en/

Ystrom, E. (2012). Breastfeeding cessation and symptoms of anxiety and depression: A longitudinal cohort study. *BioMed Central Pregnancy & Childbirth, 12*(36). doi:10.1186/1472-2393-12-36.

Zelkowitz, P., Gold, I., Feeley, N., Hayton, B., Carter, C. S.,Tulandi, T.,…Lein, P. (2014). Psychosocial stress moderates the relationships between oxytocin, perinatal depression, and maternal behavior. *Hormones and Behavior, 66*, 351-360. http:/dx.doi.org/10.1016/j.yhbeh.2014.06.014