

The Impact of Feeding Method and Infant Sleep Location on Mother/Infant Sleep, Maternal Depression, and Mothers' Well-Being

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Previous studies have found that exclusively breastfeeding (EBF) mothers get more sleep and report higher levels of well-being than mothers who are not EBF. We do not know whether infant sleep location influences these findings. The present analyses are from the Survey of Mothers' Sleep and Fatigue, an online survey of 6,410 mothers from 59 countries. Feeding method and sleep location do interact and are related to babies' and mothers' sleep and measures of mothers' well-being. EBF/bedsharing mothers reported more sleep, better physical health, and less depression, anger, and anxiety than non-EBF or nonbedsharing mothers. Conversely, bedsharing/non-EBF mothers had some of the worst outcomes. Bedsharing was related to positive outcomes for EBF mothers. Our findings are consistent with recommendations that non-EBF mothers avoid bedsharing.

Keywords: bedsharing; maternal depression; exclusive breastfeeding; maternal well-being

In perinatal mental health, some practitioners believe that nighttime feedings has a deleterious effect on mothers' mental health and recommend that mothers avoid nighttime feeding in order to prevent or treat postpartum depression (Bennett, 2007). However, studies of mothers' sleep and mental health have found the opposite to be true. Breastfeeding mothers actually got more sleep and had lower risk of depression (Doan, Gardiner, Gay, & Lee, 2007; Dørheim, Bondevik, Eberhard-Gran, & Bjorvatn, 2009a; Kendall-Tackett, Cong, & Hale, 2011). For example, Doan et al. (2007) study included 133 new mothers and fathers at 3 months postpartum. They found that exclusively breastfeeding (EBF) mothers slept 40 minutes longer than mixed- or formula-feeding mothers. Another study of 2,830 mothers at 7 weeks postpartum found that poor sleep quality increased the risk for depression (Dørheim et al., 2009a). The factors associated with poor sleep were depression, previous sleep problems, primiparity, having a younger or male infant, and not EBF.

Sleep Parameters Associated With Mental Health

Several sleep parameters are associated with postpartum depression: total sleep time, daytime fatigue, and sleep latency (minutes to get to sleep). A prospective study of 112 mothers found that postpartum depression at 3 months was more likely for mothers who slept <4 hours and napped <60 minutes/day (Goyal, Gay, &

Lee, 2009). Posmontier (2008) compared sleep of 23 women with postpartum depression, and 23 without depression at 6–26 weeks postpartum. She found that depressed women had longer sleep latency, were more likely to wake after sleep onset, and had poorer overall sleep efficiency than nondepressed women. Similarly, a study of 163 mothers at 13–20 weeks postpartum found that sleep of depressed mothers had longer sleep latency (25 vs. 20 minutes), shorter sleep duration, and more daytime dysfunction than their nondepressed counterparts (Huang, Carter, & Guo, 2004).

Breastfeeding Changes Sleep Parameters

One reason that breastfeeding may help lower risk of depression is that it changes sleep parameters. In the Survey of Mothers' Sleep and Fatigue, an online survey of 6,410 mothers from 59 countries, exclusive breastfeeding influenced several key sleep parameters (Kendall-Tackett et al., 2011). Although exclusively breastfed babies slept significantly less time at their longest stretch and woke more frequently, their mothers reported more total sleep time and fewer minutes to get to sleep, both factors specifically related to decreased risk of depression. In fact, mothers' self-reported sleep duration was a better predictor of depressive symptoms than objectively measured sleep duration (Dørheim, Bondevik, Eberhard-Gran, & Bjorvatn, 2009b). Mothers' self-reported sleep quality was specifically related to other measures of subjective well-being, such as their reported daily energy, ratings of their physical health, their reports of anxiety or anger/irritability, and their depressive symptoms (Kendall-Tackett et al., 2011).

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One surprising finding that emerged from the Survey of Mothers' Sleep and Fatigue was that all the protective effects of breastfeeding were only for exclusive breastfeeding. There was no significant difference between mixed-feeding and formula-feeding on any of the sleep or well-being variables studied (Kendall-Tackett et al., 2011). These findings were consistent with those in the study by Dørheim et al. (2009a).

Sleep Location Influence Breastfeeding Duration and Exclusivity

If exclusive breastfeeding is key to protecting maternal mental health, what protects exclusive breastfeeding? One factor that influences both breastfeeding continuation and exclusivity is infant bedsharing. Breastfeeding is more likely to continue if babies share their parents' bed at least part of the night. For example, in Ball's (2007) of 97 initially breastfeeding infants over the first 6 months, bedsharing infants were twice as likely to continue breastfeeding. Analyses from the Avon Longitudinal Study of Parents and Children (ALSPAC) longitudinal study of 14,062 families in the United Kingdom found that all bedsharing patterns were related to increased breastfeeding at 12 months (Blair, Heron, & Fleming, 2010). The Infant Feeding Practices Study II, a study of 1,846 mothers at 1, 7, 9, 10, and 12 months postpartum, found that longer bedsharing was related to increased breastfeeding at all time points (Huang et al., 2013).

Study Goals

Breastfeeding and sleep location have been studied separately, but not together. A question that has not been addressed is the combined effect of infant sleep location and feeding method. A previous analysis from this dataset revealed that approximately 60% of new mothers in this sample sleep with their babies at least part of the night. Does sleep location attenuate the impact of exclusive breastfeeding or magnify its effects? In addition, the present analyses expand on what is known about the interaction of exclusive breastfeeding and sleep location on infant sleep and maternal sleep, well-being, and mental health.

The present study explores the combined impact of feeding method and infant sleep location on the following variables:

1. *Infant sleep parameters*: Time for infant to settle, the longest stretch of sleep for infants, and number of night wakings.
2. *Mothers' sleep parameters*: Mothers' total sleep time and the number of minutes to get to sleep.

3. *Maternal mental health*: Postpartum depression, self-reported anxiety, and anger and irritability.
4. *Maternal well-being*: Self-reported physical health and daily energy.

Method

Study Participants

The data included in this analysis were from the Survey of Mothers' Sleep and Fatigue in 2008–2009. The total sample from this study was 6,410, representing 59 countries.

Sample Recruitment

The sample was recruited via announcements and flyers distributed to Women, Infants, and Children (WIC) Breastfeeding Coordinators, U.S. State Breastfeeding Coalition Coordinators, Lactation Consultants, La Leche League Leaders, and the Australian Breastfeeding Association. The investigators described the study and asked for assistance in recruiting mothers. Flyers and cards were distributed electronically and via hard copy, with a Web link for the survey. This survey was open to all mothers with babies 0–12 months of age who had access to the Website.

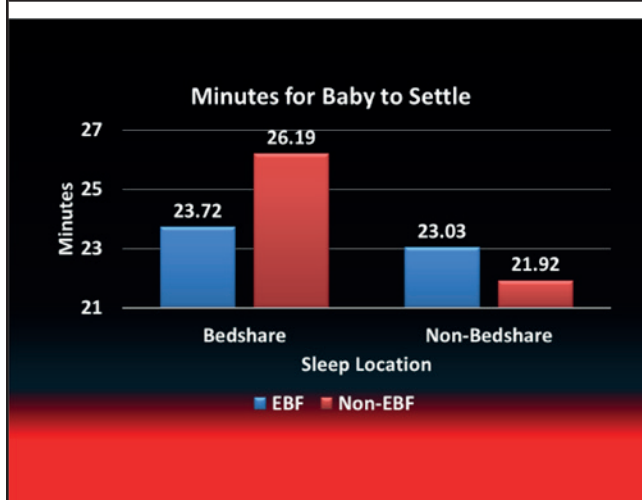
Survey Development

The research questions were taken from the 253-item Survey of Mothers' Sleep and Fatigue. The questions were predominantly close-ended in format and were developed for this study via open-ended interviews with mothers and feedback from mothers and healthcare professionals.

Items Included for the Present Analyses

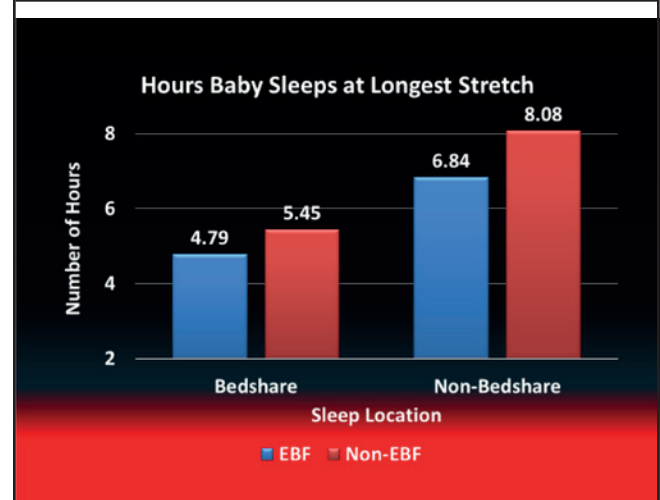
Feeding method was assessed with a series of questions about how and what babies were fed. For the present analysis, an overall summary question was used where mothers selected from one of three options: Since your baby was born, did you breastfeed, formula-feed, or both breastfeed and formula-feed? There were 4,774 mothers who indicated that they were breastfeeding only, 1,125 mothers who were mixed-feeding, and 176 mothers who indicated that they were formula-feeding. In earlier analyses, we found no significant differences between the partially breastfeeding mothers and exclusive formula-feeding mothers on any parameter that we studied. For the present analyses, partial breastfeeding and formula-feeding mothers were grouped together as non-EBF. Mothers were asked to indicate how many hours they slept in an average night. They were also asked to rate

Figure 1. Number of minutes for baby to settle for sleep.



Note. EBF = exclusive breastfeeding; non-EBF = mixed-feeding and formula feeding.

Figure 2. Number of hours baby sleeps at the longest stretch.



Note. EBF = exclusive breastfeeding; non-EBF = mixed-feeding and formula feeding.

their daily energy and overall physical well-being on a 5-point Likert scale. They also reported how many hours their babies slept at the longest stretch and how many minutes it took them to settle for sleep.

Depression was assessed via the Patient Health Questionnaire-2, a two-item screening tool for depression (Gjerdingen, Crow, McGovern, Miner, & Center, 2009). Each symptom (depressed mood and anhedonia) was rated on a scale of 0 to 3. The combined score indicated depression risk, with a higher score indicating greater risk. Mothers were asked to rate how often they were angry or irritable and anxious nervous or afraid on a 4-point scale (rarely or never, once or twice a week, once or twice a month, or nearly every day).

Data Collection

Data were collected via an online survey that was available on the Texas Tech University Department of Pediatrics Website. A screening question asked for the baby's age. If the response was 12 months or less, the mother was allowed to continue the survey. The survey and data collection procedure were reviewed and approved by the Texas Tech University School of Medicine Institutional Review Board.

Analyses

Data were analyzed via SPSS 25. We conducted a series of univariate general linear models, with feeding method and sleep location as the fixed factors. Since age of the infant could possibly influence sleep location (with older infants more often sleeping in cribs in different rooms

than the parental bedroom), we conducted a separate set of analyses with infant age included as a covariate.

Results

Sleep Parameters for Baby

Time for Baby to Settle

The main effect for feeding method was not significant ($F[1, 5,601] = 2.81, p = .094$), but there was a significant main effect for sleep location ($F[1, 5,601] = 21.12, p < .0001$) and a significant interaction between feeding method and sleep location ($F[1, 5,601] = 93.76, p < .0001$). Bedsharing infants who were not exclusively breastfed took significantly longer to settle down for sleep. EBF infants took similar amount of time to settle, regardless of sleep location (Figure 1).

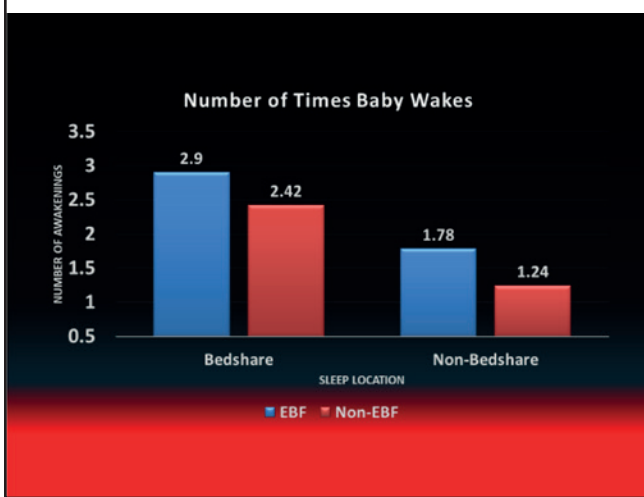
Length Baby Sleeps at Longest Stretch

There were significant main effects for both feeding methods ($F[1, 5,792] = 94.66, p < .0001$) and sleep location ($F[1, 5,792] = 574.94, p < .0001$). There was also a significant interaction ($F[1, 5,792] = 9.03, p < .003$). EBF bedsharing infants had the shortest stretch of sleep. Non-EBF, non-bedsharing infants slept for the longest time at a single stretch (Figure 2).

Number of Times Baby Wakes During Night

There were significant main effects for both feeding methods ($F[1, 5,909] = 66.11, p < .0001$) and sleep location ($F[1, 5,909] = 331.77, p < .0001$), but the interaction was not significant ($F[1, 5,909] = .188, p = .664$). Overall,

Figure 3. Number of times baby wakes during the night.



Note. EBF = exclusive breastfeeding; non-EBF = mixed-feeding and formula feeding.

bedsharing infants woke more than non-bedsharing infants, and EBF infants woke more frequently than non-EBF infants (Figure 3).

Sleep Parameters for Mother

Total Number of Hours Mothers Sleep

The main effect for sleep location was not significant ($F[1, 5,770] = 2.47, p = .116$). However, there was a main effect for feeding method ($F[1, 5,770] = 32.04, p < .0001$) and a significant interaction between feeding method and sleep location ($F[1, 5,770] = 74.37, p < .0001$). EBF, bedsharing mothers had the longest sleep duration, while non-EBF, bedsharing mothers had the lowest amount of sleep (Figure 4).

Minutes to Get to Sleep

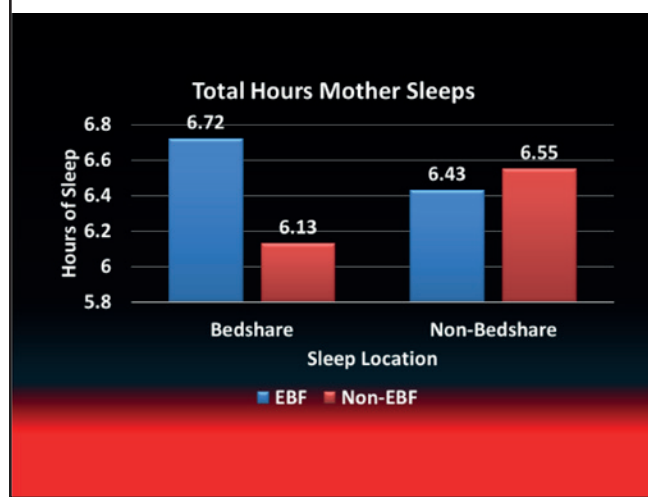
Minutes to get to sleep was specifically influenced by feeding method. EBF mothers had the lowest number of minutes to get to sleep, regardless of sleep location ($F[1, 5,949] = 32.88, p < .0001$). There was no significant effect of sleep location ($F[1, 5,949] = .114, p = .735$), nor was there an interaction between sleep location and feeding method ($F[1, 5,949] = .116, p = .733$; Figure 5).

Maternal Mental Health

Depressive Symptoms

There is a significant main effect of feeding method on depressive symptoms ($F[1, 5,897] = 32.32, p < .0001$). EBF mothers had lower depressive symptoms than non-EBF mothers, regardless of sleep location. Sleep location was

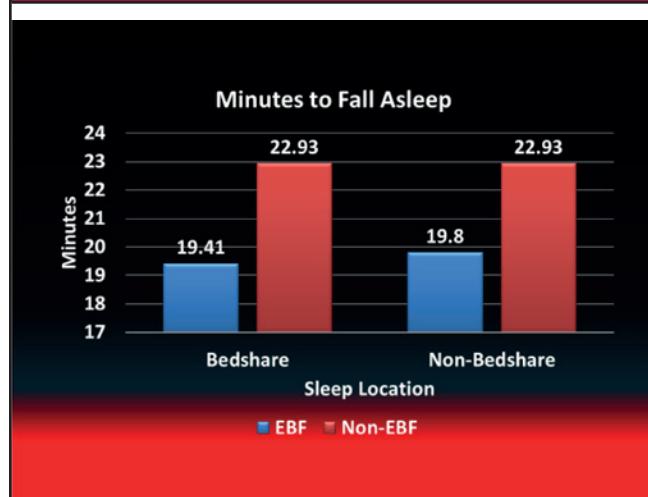
Figure 4. Total number of hours mothers report that they sleep.



Note. EBF = exclusive breastfeeding; non-EBF = mixed-feeding and formula feeding.

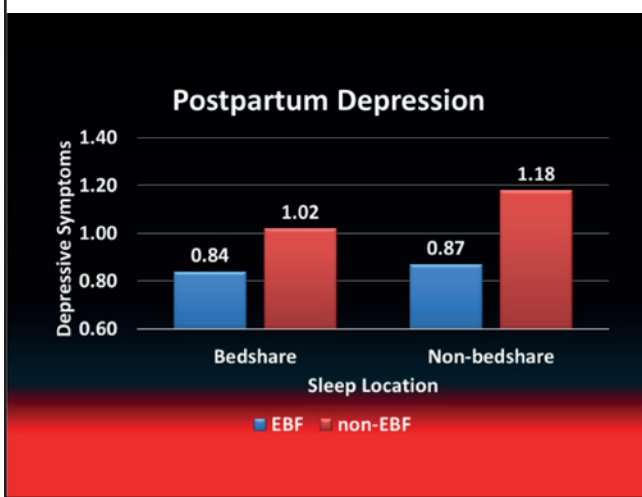
not significantly related to depressive symptoms ($F[1, 5,897] = 2.17, p = .141$), but there was a significant interaction between sleep location and feeding method ($F[1, 5,897] = 4.52, p < .033$). Non-EBF, non-bedsharing mothers reported the highest depressive symptoms. Among bedsharing mothers, non-EBF mothers had higher symptoms than EBF mothers (Figure 6).

Figure 5. Number of minutes that it takes for mother to fall asleep.



Note. EBF = exclusive breastfeeding; non-EBF = mixed-feeding and formula feeding.

Figure 6. Mothers' depressive symptoms on the Patient Health Questionnaire-2.

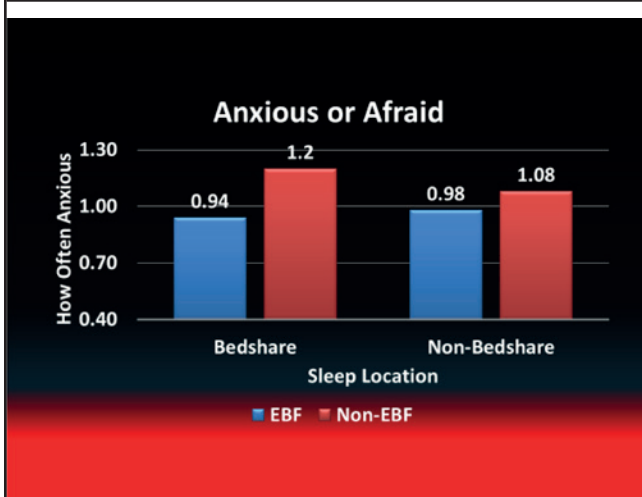


Note. EBF = exclusive breastfeeding; non-EBF = mixed-feeding and formula feeding.

Maternal Anxiety

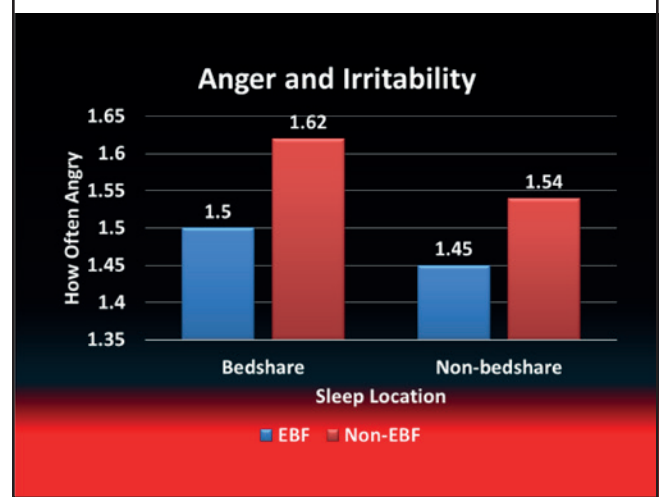
EBF mothers had lower self-reported anxiety, regardless of sleep location ($F[1, 5,948] = 29.84, p < .0001$). There was no significant main effect for sleep location ($F[1, 5,948] = 1.66, p = .198$), but there was a significant interaction of sleep location by feeding method ($F[1, 5,948] = 5.13, p < .024$). Non-EBF, bedsharing mothers had the highest levels of anxiety (Figure 7).

Figure 7. Mothers' report of how often they are really anxious or afraid.



Note. EBF = exclusive breastfeeding; non-EBF = mixed-feeding and formula feeding.

Figure 8. Mothers' report of how often they are angry or irritable.



Note. EBF = exclusive breastfeeding; non-EBF = mixed-feeding and formula feeding.

Maternal Anger and Irritability

There was a main effect for both feeding methods ($F[1, 5,949] = 9.08, p < .003$) and sleep location ($F[1, 5,949] = 5.72, p < .017$), but the interaction was not significant ($F[1, 5,949] = .443, p = .506$). The non-EBF mothers reported higher levels of anger and irritability than EBF mothers, and bedsharing mothers reported higher levels of anger and irritability than nonbedsharing mothers (Figure 8).

Maternal Physical Health

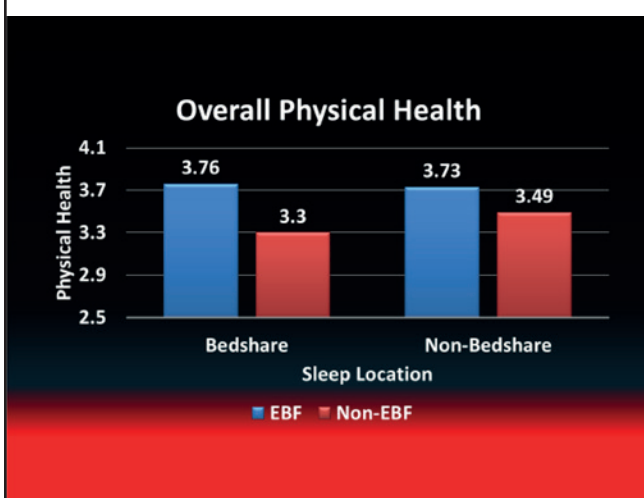
Self-Reported Physical Health

There was a significant main effect for both feeding methods ($F[1, 5,947] = 158.1, p < .0001$) and sleep location ($F[1, 5,947] = 7.13, p < .008$). In addition, the interaction between feeding method and sleep location was significant ($F[1, 5,947] = 13.47, p < .0001$). EBF mothers reported better overall health than non-EBF mothers, regardless of sleep location. Non-EBF, bedsharing mothers reported the worst physical health overall, consistent with other findings (Figure 9).

Mothers' Daily Energy

There was a significant main effect of feeding method ($F[1, 5,960] = 88.18, p < .0001$), but the main effect of sleep location was not significant ($F[1, 5,960] = 1.3, p = .252$). The interaction of feeding method and sleep location was significant ($F[1, 5,960] = 34.42, p < .0001$). Consistent with findings on sleep duration and physical health, EBF/bedsharing mothers reported the highest

Figure 9. Mothers' self-report of their overall physical health.



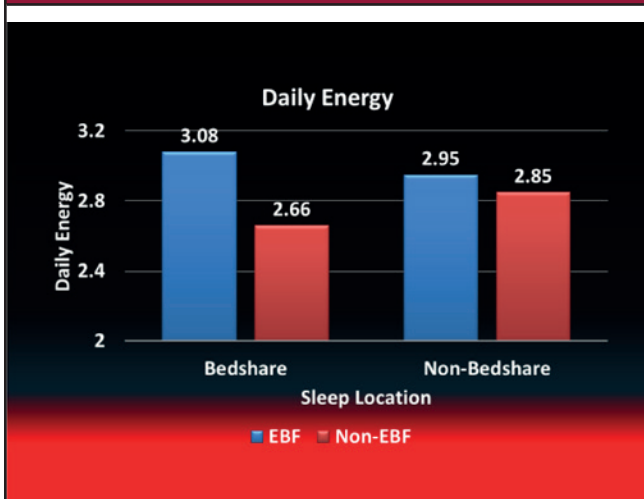
Note. EBF = exclusive breastfeeding; non-EBF = mixed-feeding and formula feeding.

daily energy levels. In contrast, the non-EBF, bedsharing mothers reported the lowest levels of daily energy (Figure 10).

Age of the Infant

To account for any possible effect of age of the infant, each of these analyses was run separately with age as a

Figure 10. Mothers' self-report of their daily energy levels.



Note. EBF = exclusive breastfeeding; non-EBF = mixed-feeding and formula feeding.

covariate. Age of infant was significant for number of minutes for the baby to settle, hours the baby sleeps at the longest stretch, number of hours the mother sleeps, and minutes it takes mother to get to sleep. Although age was a significant covariate for these variables, it did not change the direction of the findings in any case.

Discussion

The results of the present analyses indicate that feeding method and sleep location are both significantly related to the babies' and mothers' sleep parameters as well as measures of mothers' well-being. The combination of bedsharing and EBF results in the shortest sleep duration and greatest number of wakings for infants. This may be one mechanism by which EBF protects babies from Sudden Infant Death Syndrome (SIDS). Previous studies found that EBF is more likely to occur if babies are bedsharing.

Given babies' short sleep and frequent wakings, we might expect that EBF/bedsharing mothers would report shorter sleep duration and more fatigue. We found the opposite to be true. EBF/bedsharing mothers reported that they slept longer, and that they had more daily energy and better physical health. There were significant main effects of feeding method on several variables. EBF mothers reported fewer minutes to get to sleep, fewer depressive symptoms, less anxiety, and less anger and irritability, regardless of sleep location. As we found in a previous report, findings from the present study indicate that EBF is physiologically distinct from partial breastfeeding, perhaps due to the calming effects of oxytocin. Infant sleep location appears to enhance these positive effects for both mother and baby.

Another interesting finding to emerge from our analyses was the consistent negative effects of bedsharing for non-EBF mothers. For many of the variables, these mothers had the worst outcomes of all. The babies did sleep for shorter stretches and woke more frequently than babies who were not bedsharing, which likely protected them from SIDS. However, non-EBF/bedsharing mothers had the shortest sleep duration, the highest levels of anxiety and anger/irritability, the worst self-reported health, and the lowest daily energy. They also had high rates of postpartum depression, but non-EBF/non-bedsharing mothers had the highest rates. Our findings suggest that non-EBF mothers avoid bedsharing as it has a negative effect on their physical and mental health.

In conclusion, our findings indicate both feeding methods and sleep location affect sleep parameters of mothers and babies and impact measures of maternal

well-being. Bedsharing is physiologically distinct for EBF versus non-EBF mothers, and recommendations regarding sleep location should take this difference into account. Our findings also indicate that bedsharing for non-EBF mothers has a negative effect on the physical and psychological health.

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