Published in final edited form as:
*Biol Res Nurs*. 2004 April ; 5(4): 311–318.

# Sleep Patterns and Fatigue in New Mothers and Fathers

**Caryl L. Gay, PhD**, **Kathryn A. Lee, RN, PhD, FAAN**, and **Shih-Yu Lee, RN, MS**

*All authors are from the University of California, San Francisco, Department of Family Health Care Nursing. Address for correspondence: Caryl L. Gay, PhD, 2 Koret Way, Box 0606, San Francisco, CA 94143; phone: (415) 476-4435; fax: (415) 753-2161; e-mail: caryl.gay@nursing.ucsf.edu.*

## Abstract

The purpose of this study was to describe the sleep patterns and fatigue of both mothers and fathers before and after childbirth. The authors used wrist actigraphy and questionnaires to estimate sleep and fatigue in 72 couples during their last month of pregnancy and 1st month postpartum. Both parents experienced more sleep disruption at night during the postpartum period as compared to the last month of pregnancy. Compared to fathers, with their stable 24-h sleep patterns over time, mothers had less sleep at night and more sleep during the day after the baby was born. Sleep patterns were also related to parents'work status and type of infant feeding. Both parents self-reported more sleep disturbance and fatigue during the 1st month postpartum than during pregnancy. Mothers reported more sleep disturbance than fathers, but there was no gender difference in ratings of fatigue. At both time points, fathers obtained less total sleep than mothers when sleep was objectively measured throughout the entire 24-h day. Further research is needed to determine the duration of sleep loss for both mothers and fathers, to evaluate the effect of disrupted sleep and sleep loss on psychosocial functioning and job performance, and to develop interventions for improving sleep patterns of new parents.

### Keywords

sleep; fatigue; mothers; fathers; pregnancy; postpartum; naps

---

It has been well documented that women experience significant sleep changes during pregnancy and the postpartum period (Lee 1998;Horiuchi and Nishihara 1999;Shinkoda and others 1999;Kang and others 2002;Moline and others 2003;Wolfson and others 2003). Hormonal fluctuations can interfere with sleep during early pregnancy, the growing fetus makes it difficult to sleep comfortably later in pregnancy, and newborn care typically requires frequent nighttime wakenings during the postpartum period. Childbearing women have also been found to experience increasing levels of fatigue during pregnancy and postpartum (Lee and DeJoseph 1992;Milligan and Pugh 1994;Carty and others 1996;Troy and Dalgas-Pelish 1997;Lee and Zaffke 1999), although the relationship between fatigue severity and sleep quality appears to be complex (Elek and others 1997;Lee 2001). These sleep changes and accompanying increases in fatigue have implications for women's physical and mental health, relationships, employment, and parental competence.

Most studies in this area have focused solely on childbearing women. Yet fathers are also at risk for sleep disturbance and fatigue during this time. When a pregnant woman is unable to sleep, her bed partner is also likely to experience sleep disruption. Like new mothers, new fathers are subject to the random sleep-wake cycles of their newborns and often participate in their nighttime care. As a result, fathers may be experiencing sleep disruption and deprivation similar to that of mothers. Fathers also tend to return to work sooner than most mothers (Elek and others 2002), exposing them to additional job-related stress and eliminating the opportunity for napping during the day. Although a few studies have examined the role of employment factors in the general health and well-being of new fathers (Gjerdingen and Center 2003) and

mothers (Gjerdingen and Chaloner 1994; McGovern and others 1997; Killien 1998; Chen 2001; Killien and others 2001), no studies have described how work status influences sleep and fatigue in new parents.

Elek and colleagues conducted 2 studies that included both mothers and fathers, 1 describing sleep and fatigue during the 3rd trimester of pregnancy (Elek and others 1997) and a 2nd examining fatigue from the 9th month of pregnancy through the 4th month postpartum (Elek and others 2002). In the 1st study, there was no difference between mothers' and fathers' self-reported length of nighttime sleep during pregnancy, and mothers, but not fathers, experienced increasing levels of fatigue across the 3rd trimester (Elek and others 1997). In the 2nd study, Elek and others (2002) found that fatigue increased for both parents from pregnancy to 1 month postpartum, and postpartum ratings of fatigue did not differ for mothers and fathers. Building from these previous findings, the purpose of this article is to describe sleep and fatigue for both parents in late pregnancy and again in the early postpartum period using both objective and subjective measures to estimate sleep. The influence of work status and breastfeeding on new parents' sleep and fatigue is also described.

## Method

### Participants

This study was approved by the institution's Committee on Human Research (CHR). As part of a randomized clinical trial, 152 expectant couples were recruited from childbirth education classes. This study reports on the 77 couples randomly assigned to the control group. Eligible couples included those expecting their 1st child, with both individuals at least 18 years of age, willing to participate, and able to read and write English. Couples were excluded if they planned to hire a live-in nanny, if either parent worked the night shift, or if the expectant mother had a history of involuntary pregnancy loss. After informed consent was obtained from each individual, couples were assessed during their last month of pregnancy (mean time before birth = 23.1 ± 11.2 days) and during their 1st month postpartum (mean time after birth = 19.6 ± 4.3 days). Both assessments were conducted in the participants' homes, and couples were asked to independently complete the questionnaires and sleep logs. All couples were paid for their participation.

### Measures

**Objective Measures of Sleep—**To estimate sleep, each participant was asked to wear a wrist actigraph (Ambulatory Monitoring, Inc., Ardsley, NY) for 48`at both assessment points. The wrist actigraph provides continuous motion data using a battery-operated wristwatch-size microprocessor that senses motion with a piezoelectric linear accelerometer. To facilitate interpretation of the actigraph data, participants recorded bed times, wake times, and naps in 48-h sleep logs. Actigraph data were analyzed using the autoscoring program for sleep available in Action3 software (Ambulatory Monitoring, Inc., Ardsley, NY) and yielded 4 sleep-related outcome variables: 1) minutes of night sleep (TST-night), 2) minutes of day sleep (TST-day) during the 12-h period between the 1st and 2nd night, 3) total minutes of sleep (TST-total) during the 1st night and 1st day, and 4) wake after sleep onset (WASO). An estimate of fragmented sleep, WASO is reported as the percentage of minutes awake divided by minutes in bed after falling asleep. Although polysomnography (electroencephalogram, electrooculogram, and electromyogram recordings from the scalp and face) is considered the gold standard for measuring these sleep variables, it is cumbersome, more invasive, and can negatively affect sleep, particularly on the 1st night of sleep monitoring. Correlations between polysomnographic (PSG) measures and actigraphy measures indicate adequate validity ($r$ = 0.93 to 0.99) and reliability when sleep is assessed in healthy young adults, including women of childbearing age (Walsh and others 1991; Jean-Louis and others 1996; Ancoli-Israel and

others 2003) with 88% agreement between the 2 methodologies (Cole and others 1992). Specifically, total sleep time (in minutes) and percentage of the night spent asleep (100%-WASO) are correlated (0.91 and 0.89, respectively) for actigraphy and PSG data (Cole and others 1992, p 465).

**Subjective Measures of Sleep Disturbance and Fatigue—**Couples completed the 21-item General Sleep Disturbance Scale (GSDS; Lee 1992) at both assessment points. A total score can range between 0 and 147, and the internal consistency reliability coefficient (Cronbach's alpha) was 0.77 for women and 0.85 for men in this sample. Participants also completed a 7-item numerical rating version of the Visual Analog Scale for Fatigue (Lee and others 1991) each morning and evening during the 48-h assessments. In this sample, the fatigue scale had Cronbach's alpha coefficients of 0.96 for women and 0.94 for men.

### Data Analysis

Repeated measures analysis of variance was used to test the within-subjects effects of time and parent on actigraphy measures of sleep and on self-report measures of sleep disturbance and fatigue. Independent sample *t*-tests were used to evaluate the relationship of parents' work status to their sleep and fatigue at both time points. Independent sample *t*-tests were also used to evaluate the relationship between type of infant feeding and postpartum sleep and fatigue. Because TST-night and WASO on both nights were highly correlated and not significantly different (i.e., no first-night effect or need for adaptation to the actigraphy equipment), these sleep variables were averaged to obtain a mean WASO and mean TST-night for each assessment period. Fatigue ratings were also highly correlated and not significantly different between the 2 days; mean morning (AM) and evening (PM) fatigue scores were obtained by averaging the scores from both days of each assessment period.

The data were analyzed using SPSS for Windows version 11.5. An alpha level of 0.05 was used for all statistical tests. Sample sizes for each analysis reflect the number of mother-father dyads with complete data at both assessment points.

## Results

Of the 77 couples participating as controls in the study, 4 couples delivered before the initial assessment was completed and were excluded from analysis. One couple consisted of 2 females and, due to the small number of participants, was excluded from analysis. The final sample consisted of the remaining 72 couples. Mothers in the sample ranged in age from 20 to 43 (M = 32.1 ± 5.1 years) and fathers ranged in age from 22 to 53 (M = 34.6 ± 6.3 years). The sample was 68% Caucasian, 13% Asian, 12% Hispanic, 3% African American, and 4% other or mixed ethnicity. Although 71% of the women and 88% of the men were employed, only 49% of the women were working at the time of the 1st assessment in the last month of pregnancy, and only 4% of mothers and 79% of fathers were working at the time of the 2nd assessment in the 1st month postpartum. Twenty-five percent of the women had cesarean births. Most (94%) were breast-feeding to some extent, and 80% were exclusively breastfeeding. Most babies (93%) slept in their parents' room, and 51% regularly slept in their parents' bed. Sleep and fatigue outcomes were not associated with income, parents' ages, type of birth (vaginal or cesarean), parent-infant bed-sharing, or the baby's age at the postpartum assessment.

### Night Sleep

The sleep outcomes are presented in Table 1 using means and standard deviations for mothers and fathers. Mothers and fathers received comparable amounts of sleep during the last month of pregnancy. However, mothers' nighttime sleep changed significantly from pregnancy to postpartum (paired $t[57] = 3.45$, $P = 0.001$), whereas fathers' nighttime sleep changed only

slightly (paired $t[57] = 1.91$, $P = 0.062$). From pregnancy to postpartum, mothers lost an average of 41.2 min of nighttime sleep and fathers lost an average of 15.8 min. During the postpartum period, mothers obtained less sleep at night than fathers, although the difference was not significant (paired $t[57] = 1.89$, $P = 0.064$).

### WASO

In addition to less sleep time at night, mothers and fathers in the postpartum period had more disrupted sleep (Table 1). The proportion of time parents spent awake after sleep onset (WASO) increased from pregnancy to postpartum for both mothers (paired $t[57] = 10.99$, $P < 0.001$) and fathers (paired $t[57] = 6.60$, $P < 0.001$). Although both parents experienced significant nighttime sleep disruption, mothers were more affected than fathers both during pregnancy (paired $t[57] = 3.17$, $P = 0.002$) and postpartum (paired $t[57] = 8.34$, $P < 0.001$).

### Day Sleep

Daytime sleep (minutes) was not normally distributed before or after birth for either parent. Minutes of daytime sleep, as documented by wrist actigraphy during the 12-h day period, was recoded using a square root transformation due to the large proportion of 0 (no sleep) values in the data. Analysis of the raw and transformed data yielded an identical pattern of results, as did a nonparametric analysis of data categorized by those who napped and those who did not. Given the consistency of the results, the repeated measures analysis of the raw data is reported in Table 1. Mothers slept more during the day than fathers, both during pregnancy (paired $t[53] = 2.57$, $P = 0.013$) and post-partum (paired $t[53] = 6.24$, $P < 0.001$). Mothers slept more during the day postpartum than they did during pregnancy (paired $t[53] = 3.13$, $P = 0.003$), but fathers' daytime sleep did not change over time.

### Total Sleep

When the amount of night sleep and day sleep were examined together, fathers slept less than mothers both prenatally and during the postpartum period. On average, mothers slept 29.1 min longer than fathers prenatally (paired $t[53] = 2.26$, $P = 0.028$) and 33.8 min longer postpartum (paired $t[53] = 2.67$, $P = 0.010$). The total amount of sleep did not change from pregnancy to postpartum for either parent.

### Self-Reported Sleep Disturbance and Fatigue

The self-report outcomes are presented in Table 1 using means and standard deviations for mothers and fathers. Perceptions of sleep disturbance, as measured by the GSDS, differed between mothers and fathers and over time. Mothers reported more sleep disturbance than fathers at both time points, and both parents reported more sleep disturbance postpartum. GSDS scores were also correlated with morning fatigue scores for mothers and fathers at both time points (Table 2). During the postpartum period, GSDS scores were also correlated with evening fatigue scores for both mothers and fathers.

Ratings of morning fatigue and evening fatigue were analyzed separately but yielded similar results (Table 1). Morning fatigue ratings were generally higher postpartum than during pregnancy and were not significantly different for mothers and fathers. Similarly, evening fatigue ratings were higher post-partum than during pregnancy and were not significantly different for mothers and fathers. Evening fatigue ratings were significantly higher than morning fatigue ratings for both parents at both time points (paired $t[70] = 7.62$ to $8.73$, $P < 0.001$).

### Type of Infant Feeding

Because most mothers (94%) reported breastfeeding to some extent at the time of their postpartum assessment, analysis of couples' sleep and fatigue by type of infant feeding was conducted by comparing mothers who were breastfeeding exclusively (80%) with those who used infant formula exclusively or as supplementation (20%). Sleep and fatigue outcomes for the 2 groups are presented in Table 3. The sample sizes in Table 3 include only those couples with complete postpartum actigraphy and questionnaire data. Type of infant feeding was not related to self-reported sleep disturbance or fatigue for mothers or fathers. Type of infant feeding was also unrelated to actigraphy sleep measures for fathers but significantly influenced mothers'WASO, such that those who were breastfeeding exclusively had more wake time during the night. Despite a higher WASO for mothers who were breastfeeding exclusively, both groups of mothers had comparable amounts of sleep at night and during the day. Fathers' objective sleep outcomes were unaffected by type of infant feeding.

### Parental Work Status

Because few fathers (12%) were nonworking in the last month of their partners' pregnancy and few mothers (4%) were working during the 1st postpartum month, sleep and fatigue variables were compared only by mothers' work status in the last month of pregnancy and fathers' work status in the 1st postpartum month. These results are presented in Table 4. Women working in their last month of pregnancy had less night sleep, less day sleep, and an average of 67 min less total sleep than nonworking women. Women working in the last month of pregnancy also reported significantly higher levels of both morning and evening fatigue. Fathers working in the 1st postpartum month had significantly less WASO and a trend toward less perceived sleep disturbance than nonworking fathers, but otherwise had similar patterns of sleep and fatigue.

## Discussion

The results of this study support previous research on sleep and fatigue among women during the last month of pregnancy (Elek and others 1997; Mindell and Jacobson 2000) and the 1st month postpartum (Campbell 1986; Driver and Shapiro 1992; Nishihara and Horiuchi 1998; Shinkoda and others 1999; Lee and others 2000; Kang and others 2002). Women had less night sleep, more day sleep, and more WASO postpartum than they did in late pregnancy. This sleep pattern is likely a reflection of their newborns' sleep-wake cycles and will likely improve as their newborns' circadian rhythm develops. Consistent with these objectively assessed sleep changes, postpartum women perceived more sleep disturbance and experienced greater fatigue than they did late in their pregnancy. In fact, in their last month of pregnancy these women had sleep disturbance scores comparable to women working day or evening shifts, whereas their postpartum sleep disturbance scores were similar to women working permanent night or rotating shifts who are known to have significant sleep disturbance (Lee 1992). Nishihara and Horiuchi (1998) proposed that the sleep experienced by postpartum mothers may be "maternally acceptable sleep" because 8 of the 10 women in their study did not perceive their sleep to be disturbed. However, the sleep changes in the current sample of postpartum women were associated with self-reported sleep disturbance. This difference may be reflective of Eastern and Western cultural perspectives.

The results of this study indicate that fathers experience sleep changes similar to those of mothers in the postpartum period. Fathers had less night sleep, had more WASO, and reported greater fatigue postpartum than they did during their partners' pregnancy. In fact, fathers slept less overall than mothers. The finding that mothers were sleeping more than fathers does not necessarily mean that mothers are less sleep deprived than fathers. Pregnant and postpartum women, particularly if they are breastfeeding, likely have greater sleep needs as well as

nutritional needs than fathers. Furthermore, postpartum mothers experienced more WASO than fathers. New fathers had less total sleep than their partners but reported similar or better sleep quality, perhaps because of their higher sleep continuity. Regardless of objective sleep measures, both mothers and fathers reported comparable levels of postpartum fatigue. These findings are consistent with the studies by Elek and colleagues (1997(2002) documenting the similarity of mothers' and fathers' reports of sleep and fatigue during pregnancy and the postpartum period.

In this study, breastfeeding was not a significant factor in postpartum sleep and fatigue. Although the predominance of breastfeeding in our sample limits the ability to evaluate type of feeding as an influence, Wambach (1998) found similar rates of breastfeeding and similar levels of fatigue and also reported no association between fatigue and type of infant feeding. In the current study, those women who breastfed exclusively had more disrupted nighttime sleep (higher WASO) than those who used formula exclusively or as a supplement. Quillin (1997) found that breastfeeding women also self-reported more wake time at night (WASO) than bottle-feeding mothers, but her sample of breastfeeding women reported less night sleep than women who bottle-fed. Our finding of no difference in amount of sleep at night based on type of feeding may be a function of different criteria for how type of feeding is operationalized or of self-report compared to objective measures of sleep.

Finally, the sleep and fatigue differences between working and nonworking parents may have implications for childbearing couples. In this sample, women working during their last month of pregnancy slept less than the nonworking women, both at night and during the day. Not surprisingly, working women also reported higher levels of fatigue, both in the morning and in the evening. Health care providers should encourage working women to pay close attention to their sleep needs and find ways to obtain additional sleep, such as napping during work breaks and going to bed early. Because much emphasis in the health care system is placed on nutritional needs for childbearing women during both pregnancy and lactation, often summed up as "eating for two," nurses should also be addressing sleep needs for this population in a similar way, and stressing "sleeping for two" in antepartum and postpartum health care visits.

In contrast to the findings on work status and pregnant women, the sleep and fatigue of working fathers is similar to those of nonworking fathers during the postpartum period. In fact, working fathers actually experienced less nighttime sleep disruption (WASO) than nonworking fathers, possibly reflecting a tendency for couples to protect the sleep of working fathers by having mothers take primary responsibility for their newborns' nighttime care. In this study, some working fathers (15%) slept in a separate room, possibly in an attempt to ensure a sufficient amount of uninterrupted sleep. Elek and others (2002) found no relationship between fathers' work status and their fatigue and self-reported sleep at 4 weeks; however, most (73%) fathers in their study returned to work within 1 week, and the median was 3.5 days of parental leave. Further studies are needed to evaluate the relationship between fathers' work status and their participation in nighttime infant care, and the influence of both on their experience of postpartum sleep disturbance and fatigue.

Results from this study are limited to heterosexual couples with their 1st experience in parenting a newborn. These couples all lived in the San Francisco Bay area and were recruited from childbirth education classes. In general, these couples had uncomplicated pregnancies and were also older than most samples described in other studies. Therefore, results from this study cannot be generalized to all new parents, to unpartnered mothers, or to younger couples who may or may not be employed or participating together in childbirth education classes. In this sample, the rates of parent-infant room-sharing and bed-sharing were high, and the findings may not generalize to parents of solitary-sleeping infants. It is also possible that actigraphy may have underestimated actual WASO because of its sensitivity and specificity relative to

polysomnography sleep measures. Another potential bias in this study may include couples' influence on each other's responses to sleep and fatigue questions, despite instructions to complete their questionnaire booklets independently.

In summary, both expectant mothers and fathers experienced significant changes in their patterns of sleep and fatigue from late pregnancy to postpartum. These changes were evident even relative to women's last month of pregnancy, which previous research indicates is a period already characterized by sleep disruption. The results of this study provide nurses with a greater understanding of the patterns of sleep and fatigue among childbearing couples to help guide expectant couples to plan accordingly. Further studies are needed to explore the duration of these changes for both mothers and fathers, to evaluate their effect on psychosocial functioning and job performance, and to develop interventions for improving the sleep of new parents.

**Acknowledgements**

This research was supported by NIH/NINR, Grant # 1 RO1 NR045345. The authors gratefully acknowledge the technical support from Margaret Taffe, the statistical support from Dr. Steven Paul, and the commitment of the research team that included Annelise Gardner, Maria Cho, Claudia Rocha, Naomi Schoenfeld, and Valerie Tobin.

## References

Ancoli-Israel S, Cole R, Alessi C, Chambers M, Moorcroft W, Pollak CP. The role of actigraphy in the study of sleep and circadian rhythms. Sleep 2003;26(3):342–92. [PubMed: 12749557]

Campbell I. Postpartum sleep patterns of mother-baby pairs. Midwifery 1986;2:193–201. [PubMed: 3643401]

Carty EM, Bradley C, Winslow W. Women's perceptions of fatigue during pregnancy and postpartum: the impact of length of hospital stay. Clin Nurs Res 1996;5(1):67–80. [PubMed: 8680340]

Chen CH. Association of work status and mental well-being in new mothers. Kaohsiung J Med Sci 2001;17(11):570–5. [PubMed: 11852464]

Cole RJ, Kripke DF, Gruen W, Mullaney DJ, Gillin JC. Automatic sleep/wake identification from wrist activity. Sleep 1992;15:461–9. [PubMed: 1455130]

Driver HS, Shapiro CM. A longitudinal study of sleep stages in young women during pregnancy and postpartum. Sleep 1992;15:449–53. [PubMed: 1455129]

Elek SM, Hudson DB, Fleck MO. Expectant parents' experience with fatigue and sleep during pregnancy. Birth 1997;24(1):49–54. [PubMed: 9271967]

Elek SM, Hudson DB, Fleck MO. Couples'experiences with fatigue during the transition to parenthood. J Fam Nurs 2002;8(3):221–40.

Gjerdingen DK, Center BA. First-time parents' prenatal to postpartum changes in health, and the relation of postpartum health to work and partner characteristics. J Am Board Fam Pract 2003;16(4):304–11. [PubMed: 12949031]

Gjerdingen DK, Chaloner KM. The relationship of women's postpartum mental health to employment, childbirth, and social support. J Fam Pract 1994;38(5):465–72. [PubMed: 8176344]

Horiuchi S, Nishihara K. Analyses of mothers' sleep logs in postpartum periods. Psychiatry Clin Neurosci 1999;53:137–9. [PubMed: 10459671]

Jean-Louis G, von Gizycki H, Zizi F, Fookson J, Spielman A, Nunes J. Determination of sleep and wakefulness with the actigraph data analysis software (ADAS). Sleep 1996;19:739–43. [PubMed: 9122562]

Kang MJ, Matsumoto K, Shinkoda H, Mishima M, Seo YJ. Longitudinal study for sleep-wake behaviours of mothers from pre-partum to post-partum using actigraph and sleep logs. Psychiatry Clin Neurosci 2002;56:251–2. [PubMed: 12047581]

Killien MG. Postpartum return to work: mothering stress, anxiety, and gratification. Can J Nurs Res 1998;30(3):53–66. [PubMed: 10030185]

Killien MG, Habermann B, Jarrett M. Influence of employment characteristics on postpartum mothers' health. Women Health 2001;33(1–2):63–81. [PubMed: 11523641]

Lee KA. Self-reported sleep disturbances in employed women. Sleep 1992;15(6):493–8. [PubMed: 1475563]

Lee KA. Alterations in sleep during pregnancy and post-partum: a review of 30 years of research. Sleep Med Rev 1998;2(4):231–42. [PubMed: 15310494]

Lee KA. Sleep and fatigue. Ann Rev Nurs Res 2001;19:249–73. [PubMed: 11439783]

Lee KA, DeJoseph JF. Sleep disturbances, vitality, and fatigue among a select group of employed childbearing women. Birth 1992;19:208–13. [PubMed: 1472269]

Lee KA, Hicks G, Nino-Murcia G. Validity and reliability of a scale to assess fatigue. Psychiatry Res 1991;36(3):291–8. [PubMed: 2062970]

Lee KA, Zaffke ME. Longitudinal changes in fatigue and energy during pregnancy and the postpartum period. JOGNN 1999;28(2):183–91. [PubMed: 10102546]

Lee KA, Zaffke ME, McEnany G. Parity and sleep patterns during and after pregnancy. Obstet Gynecol 2000;95(1):14–18. [PubMed: 10636494]

McGovern P, Dowd B, Gjerdingen D, Moscovice I, Kochevar L, Lohman W. Time off work and the postpartum health of employed women. Med Care 1997;35(5):507–21. [PubMed: 9140338]

Milligan RA, Pugh LC. Fatigue during the childbearing period. Ann Rev Nurs Res 1994;12:33–49. [PubMed: 7986577]

Mindell JA, Jacobson BJ. Sleep disturbances during pregnancy. JOGNN 2000;29(6):590–7. [PubMed: 11110329]

Moline ML, Broch L, Zak R, Gross V. Sleep in women across the life cycle from adulthood through menopause. Sleep Med Rev 2003;7(2):155–77. [PubMed: 12628216]

Nishihara K, Horiuchi S. Changes in sleep patterns of young women from late pregnancy to postpartum: relationships to their infants'movements. Percept Motor Skills 1998;87(3):1043–56. [PubMed: 9885077]

Quillin SI. Infant and mother sleep patterns during 4th postpartum week. Iss Comprehens Pediatr Nurs 1997;20(2):115–23.

Shinkoda H, Matsumoto K, Park YM. Changes in sleep-wake cycle during the period from late pregnancy to puerperium identified through the wrist actigraph and sleep logs. Psychiatry Clin Neurosci 1999;53:133–5. [PubMed: 10459670]

Troy NW, Dalgas-Pelish P. The natural evolution of post-partum fatigue among a group of primiparous women. Clin Nurs Res 1997;6(2):126–39. [PubMed: 9188286]

Walsh JK, Schweitzer PK, Anch AM, Muehlbach MJ, Jenkins NA, Dickins QS. Sleepiness/alertness on a simulated night shift following sleep at home with triazolam. Sleep 1991;14:140–6. [PubMed: 1866527]

Wambach KA. Maternal fatigue in breastfeeding primiparae during the first 9 weeks postpartum. J Human Lactation 1998;14(3):219–29.

Wolfson AR, Crowley SJ, Anwer U, Bassett JL. Changes in sleep patterns and depressive symptoms in first-time mothers: last trimester to 1-year postpartum. Behav Sleep Med 2003;1(1):54–67. [PubMed: 15600137]

**Table 1**

Means, Standard Deviations, and Repeated Measures Analysis of Sleep and Fatigue Scores

| | Time | Mothers | Fathers | Significant Differences |
|---|---|---|---|---|
| TST-night (mins) | | | | |
| | 3rd trimester | 424.3 ± 62.7 | 419.0 ± 52.9 | $F(1, 57) = 12.4^{**}$ (T) |
| | Postpartum | 383.1 ± 76.8 | 403.2 ± 64.5 | $F(1, 57) = 4.0^{*}$ (TxP) |
| WASO (%) | | | | $F(1, 57) = 124.9^{***}$ (T) |
| | 3rd trimester | 12.4 ± 7.2 | 9.3 ± 5.2 | $F(1, 57) = 73.2^{***}$ (P) |
| | Postpartum | 28.2 ± 8.6 | 17.4 ± 8.4 | $F(1, 57) = 23.3^{***}$ (TxP) |
| TST-day (mins) | | | | $F(1, 53) = 6.1^{*}$ (T) |
| | 3rd trimester | 38.0 ± 53.7 | 18.6 ± 29.4 | $F(1, 53) = 39.6^{***}$ (P) |
| | Postpartum | 68.8 ± 64.5 | 15.5 ± 29.7 | $F(1, 53) = 10.3^{**}$ (TxP) |
| TST-total (mins) | | | | |
| | 3rd trimester | 471.0 ± 91.6 | 441.9 ± 59.3 | $F(1, 53) = 10.5^{**}$ (P) |
| | Postpartum | 457.9 ± 96.6 | 424.2 ± 89.0 | |
| GSDS score | | | | |
| | 3rd trimester | 43.9 ± 14.9 | 28.3 ± 17.3 | $F(1, 65) = 63.4^{***}$ (T) |
| | Postpartum | 55.5 ± 15.4 | 42.8 ± 14.1 | $F(1, 65) = 50.3^{***}$ (P) |
| Morning fatigue | | | | |
| | 3rd trimester | 3.7 ± 1.8 | 3.6 ± 1.6 | $F(1, 70) = 37.9^{***}$ (T) |
| | Postpartum | 4.9 ± 2.0 | 4.4 ± 1.9 | |
| Evening fatigue | | | | |
| | 3rd trimester | 5.8 ± 1.7 | 5.7 ± 1.6 | $F(1, 70) = 18.8^{***}$ (T) |
| | Postpartum | 6.8 ± 1.8 | 6.1 ± 1.6 | |

NOTE: TST = total sleep time; WASO = wake after sleep onset; GSDS = General Sleep Disturbance Scale. (T) = main effect of time; (P) = main effect of parent; (TxP) = interaction effect of time and parent.

$^{*}P \leq .05$

$^{**}P < 0.01$

$^{***}P < 0.001$.

**Table 2**

Correlations between Self-Reported Sleep Disturbance (GSDS) and Fatigue

| | Mothers | | Fathers | |
|---|---|---|---|---|
| | **Ante-partum *n*= 71** | **Post-partum *n*= 70** | **Ante-partum *n*= 70** | **Post-partum *n*= 69** |
| GSDS | | | | |
| Morning fatigue | .38** | .54*** | .52*** | .34** |
| Evening fatigue | ns | .41*** | ns | .37** |

** $P < 0.01$

*** $P < 0.001$.

**Table 3**

Independent Sample *T*-Tests of Postpartum Sleep and Fatigue by Type of Infant Feeding

| | Breastfeeding Exclusively *n* = 46 | Not Breastfeeding Exclusively *n* = 14 |
|---|---|---|
| Mothers | | |
| TST-night (mins) | 384.9 ± 80.0 | 364.2 ± 55.2 |
| WASO (%) | 30.0 ± 7.7 | 24.3 ± 10.5* |
| TST-day (mins) | 67.1 ± 55.4 | 55.4 ± 63.5 |
| TST-total (mins) | 459.9 ± 96.1 | 429.9 ± 92.3 |
| GSDS | 55.1 ± 14.4 | 59.9 ± 17.0 |
| Morning fatigue | 4.6 ± 2.0 | 5.5 ± 1.8 |
| Evening fatigue | 6.7 ± 1.8 | 6.9 ± 1.9 |
| Fathers | | |
| TST-night (mins) | 407.3 ± 9.0 | 386.4 ± 56.2 |
| WASO (%) | 17.8 ± 8.7 | 15.9 ± 7.8 |
| TST-day (mins) | 15.3 ± 30.6 | 20.7 ± 35.0 |
| TST-total (mins) | 431.3 ± 101.2 | 405.2 ± 74.8 |
| GSDS | 42.9 ± 14.9 | 42.2 ± 13.2 |
| Morning fatigue | 4.4 ± 2.0 | 4.6 ± 1.7 |
| Evening fatigue | 6.0 ± 1.6 | 6.2 ± 1.4 |

NOTE: TST = total sleep time; WASO = wake after sleep onset; GSDS = General Sleep Disturbance Scale.

* $t(58) = 2.22$, $P < 0.05$.

**Table 4**

Independent Sample *T*-Tests of Sleep and Fatigue by Parental Work Status

| | Working | Nonworking | |
|---|---|---|---|
| **Mothers Antepartum** | ***n*= 35** | ***n*= 37** | **Significant Differences** |
| TST-night (minutes) | 411.3 ± 53.8 | 442.1 ± 71.2 | $t(69) = 2.05^{*}$ |
| WASO (%) | 12.3 ± 7.7 | 13.2 ± 7.0 | |
| TST-day (minutes) | 22.9 ± 43.5 | 56.7 ± 59.7 | $t(64) = 2.76^{**}$ |
| TST-total (minutes) | 437.0 ± 80.7 | 504.3 ± 92.6 | $t(69) = 3.26^{**}$ |
| GSDS | 43.8 ± 14.7 | 44.0 ± 14.9 | |
| Morning fatigue | 4.4 ± 1.8 | 3.0 ± 1.6 | $t(70) = 3.70^{***}$ |
| Evening fatigue | 6.6 ± 1.2 | 5.1 ± 1.8 | $t(63) = 4.08^{***}$ |
| **Fathers Postpartum** | ***n* = 56** | ***n* = 15** | |
| TST-night (minutes) | 400.4 ± 75.0 | 399.9 ± 56.8 | |
| WASO (%) | 15.4 ± 7.8 | 22.6 ± 8.7 | $t(63) = 3.08^{***}$ |
| TST-day (minutes) | 14.1 ± 31.0 | 19.3 ± 27.5 | |
| TST-total (minutes) | 423.7 ± 105.3 | 423.0 ± 76.9 | |
| GSDS | 40.7 ± 14.6 | 49.1 ± 12.0 | $t(67) = 1.91$, $P = 0.06$ |
| Morning fatigue | 4.3 ± 1.7 | 4.7 ± 2.4 | |
| Evening fatigue | 6.1 ± 1.5 | 6.1 ± 2.0 | |

NOTE: TST = total sleep time; WASO = wake after sleep onset; GSDS = General Sleep Disturbance Scale.

$^{*}P < 0.05$

$^{**}P < 0.01$

$^{***}P < 0.001$.