A Comparison of Sleep and Daytime Sleepiness in Depressed and Non-Depressed Mothers During the Early Postpartum Period

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ABSTRACT: Taiwanese mothers have identified insufficient sleep as a major manifestation of postpartum depression. Few studies have thoroughly examined the relationship between sleep and depression during the early postpartum period, however. The objectives of this study were to compare the characteristics of both the postpartum sleep and daytime sleepiness of depressed first-time mothers and of their non-depressed counterparts, and to determine the factors that significantly increased mothers’ risks of being depressed. A non-probability sample of 163 first-time mothers completed a questionnaire between the 13th and 20th days of the postpartum period. The Center of Epidemiological Studies-Depression and Pittsburgh Sleep Quality Index were used to measure mothers’ experiences of depression symptoms and sleep. Daytime sleepiness was estimated in four ways, derived from the Roy Adaptation Model. The results indicated that the depressed mothers had poorer sleep quality than the non-depressed mothers, slept less efficiently, reported more sleep disturbances, and exhibited more daytime dysfunctions. Mothers who frequently perceived their daytime sleepiness to be affected by infant-care performance were more likely to be depressed. The study’s findings support the view that there is a connection between depression and poor sleep among postpartum mothers in Taiwan, and indicate that depressed mothers’ experiences of poor sleep are multi-faceted, and not simply a matter of insufficient sleep.

Key Words: daytime sleepiness, sleep, depression, Roy Adaptation Model.

Introduction

Taiwanese mothers who have experienced the energy-draining processes of labor and delivery, have identified insufficient sleep as the number one stressor during the early postpartum period (Huang, Chang & Chin, 1993). Several studies, using polysomnographic assessments and repeated measures designs, have revealed that postpartum mothers experience significant sleep loss compared to the period of pregnancy, including shortened sleep duration and fragmented sleep (Lee, Zaffke, & McEnany, 2000; Nishihara & Hhoriuchi, 1998). Indeed, because of hormone changes after childbirth, and infant care responsibilities, postpartum mothers are at risk of experiencing a shortened duration and increased fragmentation of sleep (Manber & Armitage, 1999). Studies show that these are the two major causes of daytime sleepiness (Rosenthal, Roehrs, Rosen, & Roth, 1993). Sleepiness, as a response to need for sleep, triggers sleep initiation. A sleepy mother may experience difficulty in taking care of her baby when she has to struggle against the urge to fall asleep. The impact of sleep loss depends on an individual’s sensitivity to sleep deficits. One measure of sensitivity to sleep deficit is the level of daytime sleepiness. Daytime sleepiness can be an indicator of the extent of the effectiveness of a mother’s adaptation to sleep loss. Postpartum mothers who have a high level of daytime sleepiness may have difficulty in adapting to sleep loss.

Adapting to postpartum sleep loss may be more difficult for first-time mothers than for experienced mothers.

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Studies have revealed that first-time mothers complain of not being well prepared for the non-differentiated day-and-night reality of demanding infant care (McVeigh, 1997), and they were more likely to report a larger degree of sleep loss than experienced mothers (McMillen et al., 1993). The sleep functions of neurochemical renewal and memory consolidation underpin the relationship between sleep and cognitive performance. First-time mothers with sleep loss may experience an increase in difficulties with learning and performing maternal tasks.

**Framework**

The Roy Adaptation Model (RAM) was developed in an effort to describe how people adapt to changes they encounter, and effective or ineffective adaptation is manifested through the four adaptive modes (Roy & Andrews, 1991). These four adaptive modes were used as a framework of assessment in order to identify both degree and nature of difficulties in adapting to sleep loss. In order to enhance first-time mothers’ adaptation to poor sleep, comprehensive information related to postpartum sleep and daytime sleepiness is needed.

To understand postpartum sleep and daytime sleepiness, it is important that depression is taken into account. Previous studies with community samples have revealed that depression is a significant correlate of sleep problems (Breslau, Roth, Rosenthal, & Andreski, 1996; Ford & Kamerow, 1989). In addition, a higher prevalence rate (.38-.45) of non-psychotic postpartum depression in Taiwan has been found (Chen, Tseng, Wong, & Lee, 1994; Chen, Tseng, & Chou, 1997), than those of the results (.12) of meta-analysis by O’Hara & Swain (1996), using the same criteria in a U.S. population. The purpose of this study, therefore, was to compare the characteristics of postpartum sleep and daytime sleepiness of depressed first-time mothers and their non-depressed counterparts, and to determine the significant factors that increased mothers’ risk of being depressed.

**Methods**

The study design was approved by The University of Texas at Austin Institutional Review Board. Data collection for this study was confined to a northern area of Taiwan during late December 2001 to early March 2002. The sites chosen for the recruitment of participants were four hospitals. The number of deliveries was approximately 120 to 300 monthly, and the yearly rate of cesarean section delivery among these hospitals was approximately 30% to 40%. After each hospital had approved the research in writing, a nonprobability sample was solicited from the maternity units. Volunteer participants were expected to fill out a questionnaire between the 13th and 20th days of the postpartum period and return it in postage-paid envelopes to the investigators. Mothers who completed and returned the questionnaire received, by mail, a book about self-care during the postpartum period as a thank you gift.

**Sample**

Participants in the study were healthy first-time mothers, of at least 18 years of age, who had had an uncomplicated pregnancy/delivery. Of the 400 postpartum mothers who consented to participate, 228 returned the questionnaire (response rate = 57%). Some mothers gave reasons during reminder phone calls for failing to complete the questionnaire; some of these reasons included tiredness, preferring not to read any materials during the first postpartum month, interruption by babies, and difficulty concentrating. Of the 228, some mothers (n = 38) did not respond to the questionnaire during the requested time period, one questionnaire had a missing page, and 26 mothers failed to complete all of the measures of sleep and daytime sleepiness, resulting in 163 valid responses for analysis.

The first two weeks of being with babies at home were a critical time period for mothers because a routine of sleeping and waking had not been established. The national health insurance policy in Taiwan allows mothers to stay for three or six days in maternity units for a normal delivery or cesarean section delivery, respectively. Thus, the first two weeks at home were from the 10th to the 17th day of the postpartum period for mothers with a normal delivery, and 13th to 20th day of postpartum for mothers with a cesarean section delivery. Since infant maturity might influence their sleeping/waking schedules, it was for the purpose of consistency that mothers were asked to respond to the questionnaire during 13th to 20th day of postpartum.

**Instruments**

**Postpartum sleep**

The Pittsburgh Sleep Quality Index (PSQI) was used to measure postpartum sleep in this study. The PSQI consists of seven components of sleep, including subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleeping medication, and daytime
dysfunction (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989). The items of the PSQI are grouped into these 7 components, with scores ranging from 0-3. The sum of the seven component scores forms a global PSQI score (range 0-21). Higher global scores indicate poorer sleep quality. With regard to validity, the PSQI can distinguish patients with sleep and depressive disorders from healthy adults (Buysse et al, 1989; Doi et al., 2000).

The Cronbach’s coefficient $\alpha$ was 0.53 in the current study. A low internal consistency was also found in a study of healthy adults in Japan (Cronbach’s coefficient $\alpha = .43$) (Doi et al., 2000). It was attributed to the fact that healthy subjects have large variances in component means, which might be an effect of population variance on reliability (Doi et al., 2000). The results of data analyses of both global and components scores are therefore presented in the current study.

**Daytime sleepiness**

Because the idea of daytime sleepiness as a multifaceted phenomenon has been suggested in previous studies (Pilcher, Ginter, & Sadowsky, 1997), four measures were used in this study. Daytime sleepiness was estimated in four ways derived from the four adaptive modes of the Roy Adaptation Model, including: (1) the physiological mode, (2) the self-concept mode, (3) the role function mode, and (4) the interdependence mode.

The physiological mode can be assessed from a person’s physiological behaviors (Roy & Andrews, 1991). Because the Epworth Sleepiness Scale (ESS) assesses self-estimations of an individual’s physiological sleep propensity (Johns, 1991), scores were viewed as daytime sleepiness observed from the physiological mode. The ESS asks individuals to estimate the chance of dozing off whenever they are in eight real-life situations (e.g., watching TV), instead of how frequently they fall asleep in given situations. Possible ESS scores range from 0 to 24, with higher scores indicating a higher level of sleepiness. Cronbach’s coefficient $\alpha$ was .73 in the current study.

With regard to validity, the ESS distinguished sleep disorder patients, who complained of daytime sleepiness, from healthy adults (Johns, 1991; Johns, 1992; Chung, 2000). A decrease in levels of sleepiness could be detected among patients before and after treatment (Johns, 1991; Johns, 1992; Smolley et al., 1993).

The self-concept mode can be assessed from the beliefs and feelings that people perceive about themselves at a given time (Roy & Andrews, 1991). Because the Stanford Sleepiness Scale (SSS) assesses introspective feelings of sleepiness (Hoddes, Zarcone, Smythe, Philip, & Dement, 1973), scores were viewed as daytime sleepiness observed from the self-concept mode. The SSS is a measure of sleepiness with a seven-point response scale (1 = alert to 7 = almost asleep). Mothers had to estimate their level of sleepiness during the previous week on this scale. With regard to validity, the modified SSS had been demonstrated to have a significant correlation with the a visual analog scale of sleepiness (Broughton & Ogilvie, 1992) and with the frequency of fatigue due to lack of sleep (days/week, college students, $r$ (136) = .43, $p < .05$) (Alapin et al., 2000).

The role function mode can be assessed from the manner in which a person fulfills her role expectations (Roy & Andrews, 1991). First-time mothers may, due to their daytime sleepiness, feel an increased difficulty at performing infant-care activities. Aaronson et al. (1999) suggest that a more sensitive way to assess symptoms might be to ask about how frequently the symptom interfered with activities. In addition, a similar item had been applied as an indicator of sleepiness (Manber et al., 1996). Daytime sleepiness observed from the role function mode was therefore measured by one question, “How often has your performance of infant-care been affected by sleepiness?” (1 = never, 2 = almost never, 3 = sometimes, 4 = fairly often, and, 5 = very often).

The interdependence mode can be assessed from receiving and giving behaviors (Roy & Andrews, 1991). Nap-taking was a common practice among postpartum mothers during the day (Horiuchi & Nishihara, 1999). Because postpartum mothers are expected to take care of their babies, mothers who have an opportunity to take naps may receive assistance from infant-care surrogates or may feel the baby is safe (e.g., if the baby has fallen asleep). Similar items had been applied as indicators of sleepiness (Manber et al., 1996; Strauch & Meier, 1988). Daytime sleepiness observed from the interdependence mode was therefore measured by naps taken during the day.

**Depressive Symptoms**

The Center of Epidemiologic Studies – Depression (CES-D) was used to measure mothers’ depressive symptoms in this study (Radloff, 1977). The 20-item CES-D is rated on a 4-point scale (from 0 = not at all to 3 = 5-7 days) based on mothers’ experience during the previous week. Higher scores indicate more depressive symptoms. The
internal consistency reliability of the CES-D for this study is estimated by Cronbach’s coefficient alpha (α = .93). With regard to validity, the Chinese version of the CES-D could correctly differentiate depression patients from healthy adults (sensitivity = 91.3%) and correctly identify healthy adults (specificity = 92%) (Chien & Cheng, 1985). The CES-D scores were used to dichotomize the sample into a group of depressed mothers (CES-D ≥ 16) and a group of non-depressed mothers (CES-D < 16).

Data Analyses

Multivariate statistics were used because of the multiple dependent comparisons. Significant differences on the seven components of the PSQI and the global PSQI score between the depressed and non-depressed mothers were examined by Hotelling T2. Significant differences on the four types of daytime sleepiness between the depressed and non-depressed mothers were explored by MANCOVA (multivariate analysis of covariance) using nighttime sleep quality (measured by the global PSQI score) as a covariate. The procedure is beneficial for improving power by reducing within-group variability through the use of analysis of covariance (Stevens, 1996). In addition to group comparisons, logistic regression analysis was used to explore the characteristics of sleep and daytime sleepiness in depressed mothers. Odds ratios were used to determine significant factors that increased mothers’ risk of being depressed.

Postpartum sleep and the four types of daytime sleepiness were not statistically significantly associated with age, current body mass index, and number of days after childbirth. In addition, there were no group differences in postpartum sleep and the four types of daytime sleepiness in terms of educational status, marital status, birth types, and feeding types. The data analyses therefore were not adjusted for the influence of these factors.

Results

Postpartum Sleep

The postpartum depression prevalence rate was 0.50 in this sample, using CES-D equal to 16 as a cutoff point. Eighty-two mothers were categorized into the depressed group with a mean score of CES-D of 24.60 (SD = 7.96). Eighty-one mothers were categorized into the non-depressed group with a mean score of CES-D of 8.44 (SD = 4.58).

The characteristics of the sample are shown in Table 1. Similar age (30 years), body mass index (23.1 kg/m2), and length of time after childbirth (15 days) were found in both groups. Within each group, more than half of the mothers had an educational level of college/university or above, were married, had a vaginal delivery, and used a mix of ways to feed their babies (combined breast and bottle feedings). There were no statistically significant differences between depressed and non-depressed mothers in terms of age, current body mass index, length of time after childbirth, educational status, marital status, birth types, and feeding types.

Generally speaking, depressed mothers had a poorer sleep experience than non-depressed mothers did. Within our sample, all depressed mothers were classified as poor sleepers (the PSQI ≥ 5). Only 10% of the non-depressed mothers were good sleepers (the PSQI > 5). Half (50.6%) of the non-depressed mothers reported their sleep quality was fairly bad to very bad, and this phenomenon was more obvious among depressed mothers (80.5%). The average length of time taken to fall asleep (sleep latency) was 25.6 and 20.2 minutes for depressed and non-depressed mothers, respectively. Depressed mothers (271 minutes) slept 42 minutes less than non-depressed mothers (313 minutes) at night. Both groups had low sleep efficiency (depressed vs. non-depressed mothers = 60% vs. 70%). Most mothers experienced poor sleep due to infant care instead of a diagnosed sleep disorder, resulting in only a few mothers (n = 7/163) using sleeping medication.

Table 2 illustrates the differences between depressed and non-depressed mothers on the global and seven component scores of the Pittsburgh Sleep Quality Index (PSQI). Compared to non-depressed mothers, depressed mothers had significantly poorer overall sleep quality scores (the global PSQI, p < .001). Specifically, depressed mothers ranked their sleep quality worse (one component in the PSQI, p < .001), took more time to fall asleep (sleep latency, p < .01), had shorter sleep duration at night (p < .01), lower sleep efficiency (p < .05), reported more sleep disturbances (p < .001), and exhibited more daytime dysfunctions (p < .01), compared to non-depressed mothers. Sleep duration, sleep efficiency, and subjective sleep quality were the top three sleep components which contributed most to poor overall sleep quality (the global PSQI) in both groups.

The result related to PSQI should be interpreted with caution due to low internal consistency. To view postpartum sleep as seven components could be a better way of understanding this phenomenon than to view it as a composite score of the PSQI.
Daytime Sleepiness

Four types of daytime sleepiness were derived from the adaptive modes of the Roy Adaptive model, including daytime sleepiness observed from the physiological mode, self-concept mode, role function mode, and interdependence mode. Since overall nighttime sleep experience may influence mothers’ estimation of daytime sleepiness, overall sleep quality (the global PSQI) was used as a covariate before the differences in daytime sleepiness of depressed and non-depressed mothers were compared. The results of MANCOVA revealed that only one type of daytime sleepiness (i.e., daytime sleepiness observed...
from role function mode) was significantly different in the comparison of depressed and non-depressed mothers, using the global PSQI scores as a covariate (Table 3). Depressed mothers perceived their infant-care performance as affected by daytime sleepiness (role function mode, \( p < .05 \)), more frequently than non-depressed mothers. There were no group differences on mothers’ feelings of sleepiness (self-concept mode), mothers’ estimations of the possibility of dozing off (physiological mode), or the length of naps taken during the day (interdependence mode).

### Characteristics of Sleep and Daytime Sleepiness among Depressed Mothers

The results of logistic regression analyses for mothers who were most likely to be depressed resulted in the identification of four significant factors of sleep and daytime sleepiness. In order of importance, they were: (1) sleep disturbances; (2) daytime dysfunctions; (3) sleep duration; and (4) frequency of perceiving that infant care performance was affected by daytime sleepiness (Table 4). The influence of sleep disturbance on depressive symptoms was strong. Mothers who experienced more sleep disturbances were almost four times more likely to be depressed (OR = 3.93; 95% CI = 1.74–8.89). Mothers who experienced shorter sleep duration (OR = 1.86; 95% CI = 1.12–3.10), or more daytime dysfunctions (OR = 2.01; 95% CI = 1.03–3.90) were about two times more likely to be depressed. In addition, mothers who more frequently perceived their infant care performance to be affected by daytime sleepiness were about 1.6 times more likely to be depressed (OR = 1.57; 95% CI = 1.02–2.43).

### Discussion and Conclusion

Non-psychotic postpartum depression studies in Taiwan have revealed a high prevalence rate, ranging from .38 to .45, in adult mothers (Chen, 1996; Chen et al., 1997; Chen et al., 1994). In our study, the prevalence rate was...
even higher (.50). Exploration of the relationships between sleep and depression may provide an alternative perspective for postpartum depression in Taiwan. Our findings showed that depressed mothers had poorer sleep than non-depressed mothers. This finding supported the association between depression and poor sleep among postpartum mothers in Taiwan, and was congruent with Chen and colleagues’ (1997) study findings that insufficient sleep was one of the major manifestations of postpartum depression among Taiwanese mothers. Our study went further to explore which aspects of sleep contributed to the difference in depressive symptoms. Six sleep components in the PSQI, except use of sleeping medication, significantly contributed to the differences in overall sleep quality between depressed and non-depressed mothers. This finding indicates that depressed mothers’ poor sleep is multifaceted, not just simply a matter of insufficient sleep quantity.

Both depressed mothers (mean = 10.99) and non-depressed mothers (mean = 8.17) experienced considerably poorer sleep than healthy Americans (mean = 2.67) (Buysse et al., 1989), healthy Japanese (mean = 3.78) (Doi et al., 2000), and healthy Taiwanese (mean = 5.27) (Chu, 1999). In addition, the global PSQI scores of postpartum mothers were closer to the scores of depressive patients (mean ranges from 9.33 to 11.09) (Buysse et al., 1989; Doi et al., 2000). Since postpartum sleep is an understudied area, two meta-analyses of non-psychotic postpartum depression failed to find sleep to be a correlate of postpartum depression (Beck, 1996; O’Hara, & Swain, 1996). Our findings suggest that postpartum mothers’ sleep experiences were almost as poor as those of depressive patients. The relationship between sleep and emotional regulation has been recognized by several researchers (Benca, 1997; Dahl, 1999). Poor sleep does not necessarily result in depression but may have negative effects on emotional regulation, and may further interfere with sleep. This condition then amplifies emotional distress. However, it is noteworthy that all subjects of this study were experiencing a major life event, having their first baby, which was not the case in previous studies. Researchers studying the relationship between postpartum depression and sleep need to take into account this situational context.

The purpose of the study was to compare the characteristics of postpartum sleep and daytime sleepiness in depressed first-time mothers and their non-depressed counterparts. Thus, this study was limited to exploration of the possible factors contributing to poor quality of sleep, such as social support, child’s temperament, or sleep practice (e.g. co-sleeping). However, these factors may play a significant role in influencing the relationship between poor sleep and depression. A need for research exploring the contributing factors to poor sleep has emerged.

This study is the first to thoroughly describe the phenomenon of daytime sleepiness during the early postpartum period in Taiwan. Four types of daytime sleepiness were theoretically derived from the four adaptive modes of the Roy Adaptation Model. The four types of daytime sleepiness were manifestations of mothers’ multi-faceted adaptation to poor sleep. First-time mothers who experienced daytime sleepiness may experience decreases in mental efficiency, and increases in difficulties in learning and performing maternal tasks. The severity of daytime sleepiness among postpartum mothers was revealed in this study. First-time mothers of both groups showed a higher degree of daytime sleepiness (physiological mode, measured by the Epworth Sleepiness Scale, ESS), compared to previous studies with non-clinical populations (mean of ESS in mothers = 9.91–10.16; mean of ESS in community samples = 5.9–7.6) (Chung, 2000; Taillard, Philip, & Bioulac, 1999). In addition, mothers’ degree of daytime sleepiness (self-concept mode, measured by the Stanford Sleepiness Scale, SSS) was similar to that of those who experienced partial sleep deprivation (sleep duration in mothers = 271–313 minutes; sleep duration in healthy subjects = 276–299 minutes) for a week (mean of SSS in mothers = 3.84–4.18; mean of SSS in healthy subjects = 3.75–4.30) (Dinges et al., 1997; Herscovitch & Broughton, 1981). However, depressed mothers did not exhibit a higher degree of daytime sleepiness than that of non-depressed mothers on these two types of daytime sleepiness (physiological and self-concept modes), after adjustments were made for overall sleep quality (scores of the global PSQI).

Naps taken during the day were defined as another type of daytime sleepiness in this study (interdependence mode). Both groups of mothers spent about two hours napping during the day (depressed vs. non-depressed mothers = 101 vs. 113 minutes, p = .21). Since 78% of the mothers in the current study were employed prior to childbirth, two hours of napping would not be a usual practice for them. This phenomenon implies that mothers took naps to counteract their poor nighttime sleep. Although mothers had a chance to take naps during the day, their estimations of
daytime sleepiness (physiological and self-concept modes) were still more severe than those of other non-clinical populations.

Within our sample, mothers who experienced more sleep disturbances, short sleep duration, more daytime dysfunctions, and frequently perceived their performance of infant-care to be affected by daytime sleepiness, had a higher level of depressive symptoms. This finding revealed a problem that has not been recognized in previous studies. Poor sleep experiences during the early postpartum period may not just be an inevitable challenge for mothers, but may increase mothers’ risk of depression. Reconsidering the importance of postpartum sleep is necessary for the prevention of postpartum depression. Management of sleep during the early postpartum period must be emphasized in perinatal care in order to provide quality care for childbearing women, as well as to stave off the devastating effects that postpartum depression can have on the mother, child, and family unit.

Our suggestions for the improvement of sleep quality, are as follows. (1) keeping a log of the baby’s sleep: mothers could gain from this an understanding of the baby’s activity and rest pattern. Mothers may then be able to arrange self-care and daily activities without conflict with the baby’s schedule on the basis of information provided by the log. (2) creating an environment for good sleep: mothers may design a suitable climate for sleep in the bedroom. Playing soft music, providing gentle light and comfortable bedclothes are some ways to improve sleep quality. It is not recommended to use the bedroom as a multifunctional place, such as a place to sleep, to eat, to watch TV. Activities other than sleep should be performed outside of the bedroom. (3) assistance with family chores: to ensure that the mothers can have quality time with their babies, relieving them of family responsibilities other than those for baby-care is necessary. Mothers could also gain spare time to rest, with such assistance. If possible (e.g. one day a week), a baby-care surrogate could enable mothers to fulfill their desire to sleep through the night without interruption. (4) having a moderate level of physical activity during the day: improve sleep quality, mothers are encouraged to have a certain level of physical activity, although this suggestion may violate the practice, in Chinese culture, of “doing-the-month”. However, physical activity has been shown by research to have a positive effect on sleep quality. In sum, our suggestions are general and not specific to any individual. Nurses who would like to apply these suggestions need to assess the mothers’ contextual situations in advance. An appropriate nursing care plan could be proposed, on the basis only of nursing assessment information.

References


