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*Field Study*

# The impact of rotating night shifts on the breast milk collection volume among employed breastfeeding mothers

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**Abstract: The impact of rotating night shifts on the breast milk collection volume among employed breastfeeding mothers: Chien-Cheng Huang, *et al.* Department of Emergency Medicine, Chi-Mei Medical Center, Taiwan—Objectives:** The health benefits of breastfeeding are widely recognized. The World Health Organization recommends exclusive breastfeeding for six months after birth and for two years or longer together with nutritionally adequate complementary foods. To respond to the needs of industry, employed breastfeeding mothers must adapt to the rotating night shift (RNS). However, the RNS is associated with a higher risk of health problems in career women. We investigated the relationship between the RNS and breast milk volume. **Methods:** Mothers who used a breastfeeding room while working at a technology company in Taiwan voluntarily participated in this study from March 1 through April 30, 2013. We compared two groups: breastfeeding mothers on ($RNS^+$) and not on a RNS ($RNS^-$) to determine independent predictors for breast milk volume. We analyzed data from 109 participants: $RNS^+$ group n=56; $RNS^-$ group n=53. **Results:** There was no significant difference in daily milk collection volume between the groups. Daily milk collection frequency and exclusive breastfeeding were independent predictors for a daily breast milk collection volume >350 m*l*. **Conclusions:** The RNS may not affect the breast milk volume. This result may help the government and employers make policies more appropriate for supporting employed breastfeeding mothers.
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**Key words:** Breastfeeding, Breast milk, Rotating night shift, Women

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It is indisputable that breast milk is the most suitable natural food for infants[1]. The health benefits of breastfeeding have been widely recognized, e.g., a reduced use of health services and fewer cases of postnatal death; acute respiratory infection; death from diarrhea; and childhood asthma, atopy, obesity and atherosclerosis[2]. In addition, it fosters the mother-child relationship because of the close physical contact while breastfeeding[1]. The World Health Organization (WHO) and other international health bodies have recommended exclusive breastfeeding for six months after birth[3–5]. It is also recommended that breastfeeding continue for two years or longer together with nutritionally adequate complementary foods[6, 7].

Because of changing society and family structures, a growing number of women must find outside-the-home employment[8], which is an important reason that some mothers stop breastfeeding[9, 10]. To respond to the needs of industry, employed breastfeeding mothers must adapt to the rotating night shift (RNS). However, the RNS is associated with a higher risk of health problems in career women: irregular menstrual cycles, endometriosis, infertility, miscarriage, low birth-weight or preterm delivery and a lower incidence of breastfeeding at 1 and 2 months after birth[9–11]. Based on what is known about circadian regulation of endocrine rhythms in rodents (and we know much less about them in humans), the circadian clock is an integral regulatory part of the reproductive system[9]. When this 24-h program is disordered by environmental perturbation (such as a RNS) or genetic mutations, the endocrine system can be impaired[9].

Constructing a breastfeeding-friendly public-space environment and implementing breastfeeding-friendly employment policy are driving forces to promote breastfeeding by career women. After ten years of continuous effort by the government to promote breastfeeding, the breastfeeding rate in Taiwan has continued to rise[12]. In 1998, the exclusive breastfeeding rate was only 5.4% and the mixed feeding rate was 21.2% in the postpartum 1st month[12]. In 2011, the exclusive breastfeeding rate had risen to 68.6% in the postpartum 1st month, 61.6% in the postpartum 2nd month, 52.9% in the postpartum 4th month, and 45.6% in the postpartum 6th month[12]. In spite of the improvement, however, the RNS is still another problem for employed breastfeeding mothers. Until now, the relationship between the RNS and breast milk has been unclear. Does the RNS affect breast milk volume? Are there other factors that affect breast milk volume? If we can answer these questions, our government and employers could make policies more appropriate for supporting employed breastfeeding mothers. Thus, we investigated the relationship between the RNS and breast-milk volume. We hypothesized that an RNS may affect the breast milk volume.

## Materials and Methods

*Study design, setting and selection of participants*

This study was done in a technology company in Taiwan. This company produces all kinds of TFT-LCD (Thin Film Transistor Liquid Crystal Display), LCD panel module (modules) and semifinished products (open cells). There are about 20,000 workers, with an equal male to female ratio and a ratio of 7:3 for direct and indirect personnel. Direct personnel are mainly production line technicians, and indirect personnel comprise research and development, process equipment, quality assurance, environmental safety, logistics and other professional staff. The numbers of directly hired full-time female employees to work on ($RNS^+$) and not on a RNS ($RNS^-$) were 7,000 and 1,500, respectively. The amount of rest time for employed breastfeeding mothers is 2 hours of regular rest time plus 1 hour of additional rest time (30 minutes a time, 2 times a day). One hundred nine employed breastfeeding mothers who used the company's workplace breastfeeding room from March 1, 2013, through April 30, 2013, voluntarily participated in this study. They milked and measured the volume by themselves. Assignments to the $RNS^+$ and $RNS^-$ groups were dependent on the real working conditions of the volunteers and were not intentionally selected. All participants were directly hired and full-time employees and had 2 months of parental leave.

*Data collection*

This study was carried out in compliance with the Helsinki Declaration and Institutional Review Board (IRB) at Chi-Mei Medical Center, and verbal consent was obtained from all the participants. We first constructed a digital data collection system on the company's intranet. The data collected included RNS, age, parity (the number of times a woman has given birth to a fetus with a gestational age of 24 weeks or more), time after giving birth, daily milk collection frequency, daily milk collection volume, daily water intake, intake of lactation-promoting food (soup, black wort and Chinese herbs), whether or not breastfeeding was exclusive (baby consumes no other food except water during lactation) and whether or not they got adequate sleep (≥8 hours daily). We then asked all the participants to use the data collection system. The participants who used the breastfeeding room voluntarily entered their data. On April 30, 2013, which is when the study ended, we collected all the data from the intranet.

*Definition of work schedule variables*

In this company, the day shift is 07:30–19:30, and the night shift is 19:30–07:30. RNS was defined as having the 2-2 rotating shift schedule, which uses 4 teams (work crews) and two 12-hour shifts to provide 24/7 coverage (Table 1). It consists of an 8-week cycle in which the first team works 2 consecutive day shifts followed by 2 days off duty. The second team works 2 consecutive night shifts followed by 2 days off duty. The third team has 2 days off duty followed by 2 consecutive day shifts. The fourth team has 2 days off duty followed by 2 consecutive night shifts. Not working an RNS was defined as working 08:00 to 17:30 5 days per week.

**Table 1.** The 2-2 rotating shift schedule that uses 4 teams (crews) and 2 twelve-hour shifts to provide 24/7 coverage

| Team | Day 1 | Day 2 | Day 3 | Day 4 |
|---|---|---|---|---|
| 1 | Day shift | Day shift | Off | Off |
| 2 | Night shift | Night shift | Off | Off |
| 3 | Off | Off | Day shift | Day shift |
| 4 | Off | Off | Night shift | Night shift |

The day shift is 07:30–19:30; the night shift is 19:30–07:30. The cycle is 8 weeks: Team 1→Team 2; Team 2→Team 3; Team 3→Team 4; Team 4→Team 1.

*Data analysis*

All analyses were done using SPSS 16.0 for Windows (SPSS Inc, Chicago, IL, USA). Continuous data are presented as means ± standard deviation (SD). Comparisons of the RNS$^+$ and RNS$^-$ groups were done using either an independent-samples $t$ test (assuming a normal distribution) or Mann-Whitney/Wilcoxon tests (assuming a non-normal distribution) for the continuous variables. Either a $\chi^2$ test or a Fisher's exact test was used for categorical variables. We divided the daily milk collection volume into three groups (<250 m*l*, n=38;. 250–500 m*l*, n=37; >500 m*l*, n=34) according to participants number and closest and easy memory number of volume. One-way analysis of variance (ANOVA) was used to compare the three daily milk collection volume groups. We used a daily milk collection volume >350 m*l* as a primary end point and performed univariate and multiple logistic regression analyses to investigate independent predictors for this volume. We used 350 m*l* as a cut-point because it was the 50th percentile of the daily milk collection volume. The significance $\alpha$ level was set at 0.1 for univariate variables in the multiple logistic regression analyses. Significance was set at $p$<0.05 (two tailed). Figure 1 shows the study flowchart.

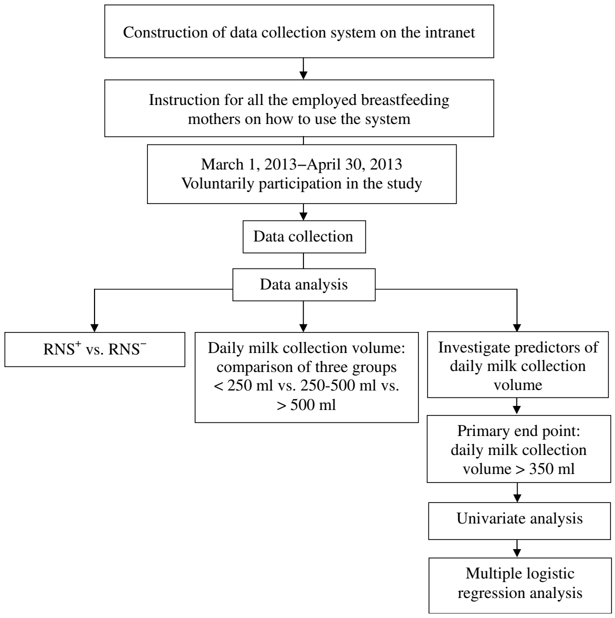


**Fig. 1.** Flowchart of this study.

## Results

One hundred and nine employed breastfeeding mothers (mean age, 32.2 ± 3.1 years; postnatal stage, mean=5.2 ± 3.6 months, median=4.5 months, range=0.2–17 months) participated in this study. There were no significant differences between the RNS$^+$ and RNS$^-$groups, including daily milk collection volume (Table 2). Comparison of the daily milk collection volumes of the three groups (<250 m*l* vs. 250–500 m*l* vs. >500 m*l*) revealed that increased daily milk collection frequency (2.4 ± 1.6 vs. 2.7 ± 1.4 vs. 3.4 ± 1.0; $p$=0.004) and exclusive breastfeeding ($p$<0.001) were associated with collection of a larger daily volume of milk (Table 3). Univariate analysis revealed parity 2 (OR, 3.2; 95% CI, 1.1–9.1), daily milk collection frequency (OR, 1.5; 95% CI, 1.1–2.2), and exclusive breastfeeding (OR, 2.8; 95% CI, 1.1–7.1) were predictors for daily milk collection volume >350 m*l* (Table 4). After a multiple logistic regression analysis, daily milk collection frequency (OR, 1.5; 95% CI, 1.1–2.0) and exclusive breastfeeding (OR, 2.9; 95% CI, 1.3–6.7) were independent predictors for a daily milk collection volume >350 m*l* (Table 4). Each additional daily milk collection increased the total volume collected by 65.2 m*l*. Compared with women who both breastfed and bottle-fed their infants (i.e., mixed feeding), women who exclusively breastfed their infants collected more than 340.5 m*l* of milk daily.

## Discussion

We found that there was no significant difference in the daily milk collection volume between employed RNS$^+$ and RNS$^-$ breastfeeding mothers. Daily milk collection frequency and exclusive breastfeeding were the independent predictors for a daily milk collection volume >350 m*l*. This information may help the government and employers make policies that are more appropriate for supporting employed breastfeeding mothers.

Both daytime sleep and nighttime work are associated with perturbed endocrine function, which might explain certain health problems and sleep disorders observed in or claimed by breastfeeding mothers after several years of night shift work[13]. At least one study[11] reported that rotating shift work was an independent predictor of menstrual cycle irregularity. Employed breastfeeding mothers also undergo physi-

**Table 2.** Comparison of employed RNS$^+$ and RNS$^-$ breastfeeding mothers

| Variable | Total (n=109) | RNS$^+$ (n=56) | RNS$^-$ (n=53) | *p*$^-$ value |
|---|---|---|---|---|
| Age (years)† | 32.2 ± 3.1 | 32.1 ± 3.1 | 32.4 ± 3.2 | 0.57 |
| Parity‡ | | | | 0.337 |
| 1 | 67 (61.5) | 31 (55.4) | 36 (67.9) | |
| 2 | 34 (31.2) | 21 (37.5) | 13 (24.5) | |
| 3 | 8 (7.3) | 4 (7.2) | 4 (7.6) | |
| Time after giving birth (months)† | 5.2 ± 3.6 | 5.2 ± 3.8 | 5.1 ± 3.4 | 0.893 |
| Daily milk collection frequency (/day)† | 2.8 ± 1.4 | 2.8 ± 1.3 | 2.9 ± 1.5 | 0.81 |
| Daily milk collection volume (m*l*)† | 499.8 ± 422.1 | 496.8 ± 437.2 | 503.6 ± 407.0 | 0.496 |
| Daily water intake (m*l*)† | 1,360.8 ± 660.8 | 1,317.9 ± 681.8 | 1,404.7 ± 642.9 | 0.933 |
| Intake of lactation promoting food‡ | | | | |
| Yes | 48 (44.0) | 23 (41.0) | 25 (47.2) | 0.566 |
| No | 61 (56.0) | 33 (59.0) | 28 (52.8) | |
| Exclusive breastfeeding‡ | | | | 0.56 |
| Yes | 64 (58.7) | 31 (55.6) | 33 (62.3) | |
| No§ | 45 (41.3) | 25 (44.6) | 20 (37.7) | |
| Adequate sleep (≥8 h)‡ | | | | |
| Yes | 20 (18.4) | 10 (17.9) | 10 (18.9) | >0.99 |
| No | 89 (81.6) | 46 (82.1) | 43 (81.1) | |

†The data are presented as means ± SD (standard deviation). ‡The data are presented as numbers (%). §Mixed breastfeeding. RNS, rotating night shift.

**Table 3.** Comparison of the daily milk collection volumes of employed RNS$^+$ and RNS$^-$ breastfeeding mothers

| Variable | Total (n=109) | <250 m*l* (n=38) | 250–500 m*l* (n=37) | >500 m*l* (n=34) | *p* value |
|---|---|---|---|---|---|
| Age (years)† | 32.2 ± 3.1 | 32.2 ± 2.9 | 32.2 ± 3.4 | 32.4 ± 3.3 | 0.962 |
| RNS‡ | | | | | 0.119 |
| RNS$^+$ | 56 (51) | 23 (60.5) | 14 (37.8) | 19 (55.8) | |
| RNS$^-$ | 53 (49) | 15 (39.5) | 23 (62.2) | 15 (44.1) | |
| Parity‡ | | | | | |
| 1 | 67 (61.5) | 26 (68.4) | 22 (59.5) | 19 (55.9) | 0.511 |
| 2 | 34 (31.2) | 8 (21.1) | 13 (35.1) | 13 (38.2) | |
| 3 | 8 (7.3) | 4 (10.5) | 2 (5.4) | 2 (5.9) | |
| Time after giving birth (months)† | 5.2 ± 3.6 | 5.3 ± 4.0 | 5.1 ± 3.9 | 5.1 ± 2.7 | 0.958 |
| Daily milk collection frequency (/day)† | 2.8 ± 1.4 | 2.4 ± 1.6 | 2.7 ± 1.4 | 3.4 ± 1.0 | 0.004 |
| Daily water intake (m*l*)‡ | | | | | 0.433 |
| ≤1,200 m*l* | 57 (52.3) | 20 (52.6) | 22 (59.5) | 15 (44.1) | |
| >1,200 m*l* | 52 (47.7) | 18 (47.4) | 15 (40.5) | 19 (55.9) | |
| Intake of lactation promoting food‡ | | | | 0.6 | |
| Yes | 48 (44.0) | 19 (50) | 16 (43.2) | 13 (38.2) | |
| No | 61 (56.0) | 19 (50) | 21 (56.8) | 21 (61.8) | |
| Exclusive breastfeeding‡ | | | | | <0.001 |
| Yes | 64 (58.7) | 12 (31.6) | 21 (56.8) | 31 (91.2) | |
| No§ | 45 (41.3) | 26 (68.4) | 16 (43.2) | 3 (8.8) | |
| Adequate sleep (≥8 h)‡ | | | | | 0.159 |
| Yes | 20 (18.4) | 10 (26.3) | 7 (18.9) | 3 (8.8) | |
| No | 89 (81.7) | 28 (73.7) | 30 (81.1) | 31 (91.2) | |

†The data are presented as means ± SD (standard deviation). ‡The data are presented as numbers (%). §Mixed breastfeeding. RNS, rotating night shift.

**Table 4.** Univariate analysis and multiple logistic regression analysis using daily milk collection volume >350 m*l* as the primary end point

| Variable | Univariate analysis<br>OR (95% CI) | Multiple logistic regression analysis<br>OR (95% CI) |
|---|---|---|
| Age (years) | 1.0 (0.9–1.2) | NA |
| With RNS | 2.0 (0.8–5.0) | NA |
| Parity | | |
| 1 | 1 | NA |
| 2 | 3.2 (1.1–9.1) | NA |
| 3 | 1.3 (0.2–8.7) | NA |
| Time after giving birth (months) | 0.9 (0.9–1.1) | NA |
| Daily milk collection frequency (/day) | 1.5 (1.1–2.2) | 1.5 (1.1–2.0) |
| Daily water intake (m*l*) | 1 | NA |
| Intake of lactation promoting food | 1.4 (0.5–3.6) | NA |
| Exclusive breastfeeding | 2.8 (1.1–7.1) | 2.9 (1.3–6.7) |
| Adequate sleep (≥8 h) | 1.8 (0.6–5.6) | NA |

OR, odds ratio; CI, confidence interval; RNS, rotating night shift; NA, not applicable.

ological changes, such as decreased immunity and a changed biological clock, because of the RNS[13]. Melanocytes, inhibin, cortisol, and thyroid gland hormone are affected by the biological clock, and prolactin is affected by sleep[13]. Prolactin, also known as lactotrope, is a protein probably best known for enabling women to produce milk[14]. Prolactin increases after adequate sleep or short-term resting[13]. In our study, the RNS was a 2-2 rotating shift schedule that used 4 teams and two 12-hour shifts to provide 24/7 coverage. This method allowed employed breastfeeding mothers to get adequate sleep and rest. We think that this is why the RNS did not affect daily milk collection volume in the participants in this study. In addition, several years of night-shift work are required to change endocrine functions[13]. There was not enough follow-up time to see the effect of RNS in our study participants.

Shift schedules that provide coverage 24 hours/day, 7 days/week (often called 24/7 shift schedules) are hot topics in manufacturing and service industries. These shift schedules maximize asset utilization and customer service, which are viewed as keys to success in today's competitive business environment. Many shift schedules are used for different kinds of industries; however, there are no comparative studies about the health of RNS workers in the literature. In Taiwan, the 2-2 rotating shift schedule, which uses 4 teams and two 12-hour shifts to provide 24/7 coverage, is the most common schedule in technology companies, a type of company that Taiwan specializes in.

In this study, the frequencies of daily milk collection and exclusive breastfeeding were associated with the daily volume collected. Mixed feeding can also affect the milk supply, especially if it begins when the baby is still very young (less than 6 weeks old). Breast milk works on a supply-and-demand basis: the more formula a mother gives her baby, the less milk the mother will produce. There have been few studies of expressed milk volumes, but there are a number of reports on the daily volume of milk produced by breastfeeding mothers[15]. Overall, they show that the greater the frequency of expression or suckling, the more breast milk is produced[15]. The hormonal endocrine control system drives milk production during pregnancy and for the first few days after the birth. From the 24th week of pregnancy (the 2nd and 3rd trimesters), a woman's body produces hormones that stimulate the growth of the milk duct system in the breasts. Progesterone influences the growth in the size of the alveoli and lobes; high levels of progesterone, estrogen, prolactin, and other hormones inhibit lactation before birth; hormone levels drop after birth, which triggers the onset of milk production[16]. After birth, the hormone oxytocin contracts the smooth-muscle layer of cells surrounding the alveoli to squeeze milk into the duct system[16]. Oxytocin is also necessary for the milk ejection or let-down reflex to occur[16]. Let-down occurs in response to the baby's suckling or expression by hand or pump, but it might also be a conditioned response to, e.g., the cry of the baby[16].

This study has several limitations. First, a selection bias may exist because the data submitted by the employed breastfeeding mothers who voluntarily used the breastfeeding room. Second, we used only one kind of rotating shift schedule, the most common in Taiwan's technology companies. Findings from our database may not be generalizable to breastfeeding mothers on other kinds of rotating shifts. Third, the sample size might not be large enough to make conclusions with good statistical power. Additional studies with larger sample sizes are necessary.

## Conclusion

An RNS may not affect the breast milk volume, which may help us make more appropriate policies to support employed breastfeeding mothers.

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*Author contributions*: CC Huang and MHC collected, analyzed, and interpreted the data and drafted the manuscript. SJL, HJL, HRG, and HYW provided clinical experience and revised the manuscript. SBS and CC Hsu conceived the study, participated in the design, supervised the conduct of the study, and helped to draft the manuscript. All authors read and approved the final manuscript.

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## References

1) Saadeh RJ, Labbok MH, Cooney KA, Koniz-Booher P (eds). Breast-feeding: The technical basis and recommendations for action. Geneva (Switzerland): World Health Organization; 1993.
2) Chuang CH, Chang PJ, Chen YC, et al. Maternal return to work and breastfeeding: a population-based cohort study. Int J Nurs Stud 2010; 47: 461–74.
3) Kramer MS, Kakuma R. Optimal duration of exclusive breastfeeding. Cochrane Database Syst Rev 2012, 8, CD003517.
4) World Health Organization. Exclusive breastfeeding for six months best for babies everywhere. [Online]. 2011 [ cited 2014 Mar 29]; Available from: URL: http://www.who.int/mediacentre/news/statements/2011/breastfeeding_20110115/en/
5) American Academy of Pediatrics: Breastfeeding and the use of human milk. Pediatrics 2012; 129: e827–41.
6) World Health Organization: Planning guide for national implementation of the Global Strategy for Infant and Young Child Feeding. Geneva: WHO; 2007.
7) James DC, Lessen R. Position of the American Dietetic Association: promoting and supporting breastfeeding. J Am Diet Assoc 2009; 109: 1926–42.
8) Biancuzzo M. Factors influencing successful Breastfeeding. In M. Biancuzzo (ed). Breastfeeding the newborn: Clinical strategies for Nurses (2nd). St Louis (MO): Mosby; 2003. p. 35–52.
9) Gamble KL, Resuehr D, Johnson CH. Shift work and circadian dysregulation of reproduction. Front Endocrinol (Lausanne) 2013; 4: 92.
10) Lakati A, Binns C, Stevenson M. The effect of work status on exclusive breastfeeding in Nairobi. Asia Pac J Public Health 2002; 14: 85–90.
11) Su SB, Lu CW, Kao YY, Guo HR. Effects of 12-hour rotating shifts on menstrual cycles of photoelectronic workers in Taiwan. Chronobiol Int 2008; 25: 237–48.
12) Taiwan Health Promotion Administration. Domestic breastfeeding status. [Online]. 2012 [cited 2014 Mar 10]; Available from: URL: http://mammy.hpa.gov.tw/kbcontent.asp?cid=354&ty=%2D1&ti=%E6%AF%8D%E4%B9%B3%E5%93%BA%E8%82%B2%E5%9C%8B%E5%85%A7%E7%8F%BE%E6%B3%81
13) Weibel L, Follénius M, Brandenberger G. Biologic rhythms: their changes in night-shift workers. Presse Med 1999; 28: 252–8.
14) Bole-Feysot C, Goffin V, Edery M, Binart N, Kelly PA. Prolactin (PRL) and its receptor: actions, signal transduction pathways and phenotypes observed in PRL receptor knockout mice. Endocr Rev 1998; 19: 225–68.
15) Life's little treasures foundation. Breastmilk expressing. [Online]. 2014 [cited 2014 Feb 9]; Available from: URL: http://www.lifeslittletreasures.org.au/prematurity-resources/prematurity-articles/breastmilk-expressing/
16) Mohrbacher N, Stock J. The Breastfeeding Answer Book (3rd ed.). Schaumburg (IL) La Leche League International; 2003.