The Impact of Self-perceived Job Stress on Menstrual Patterns among Taiwanese Nurses

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Abstract: The purpose of this study was to assess the impact of self-reported job stress on menstrual patterns among nurses. We conducted a cross-sectional survey of nursing staff from five psychiatric institutions and four general hospitals in Taiwan. A total of 746 participants were eligible for the final analysis, among whom, 72.3% were ascertained as having a self-perceived high level of job stress. Self-perceived high job stress was significantly associated with irregular menstrual cycles [Adjusted odds ratio (AOR): 4.8, 95% confidence interval (CI): 3.3–7.2] and longer menstrual bleeding periods (more than 7 d) [AOR: 2.5, 95% CI: 1.7–3.7], but was not significantly related to long or short menstrual cycles. Overall, this study suggests that nurses' self-perceived job stress may be associated with certain aspects of menstrual dysfunction. Further investigations with prospective follow-up studies and urine hormonal measurements are now recommended to provide additional insight into the pathophysiological mechanisms of our findings.

Key words: Nursing personnel, Self-perceived job stress, Menstrual patterns, Menstrual cycle

Introduction

Occupational psychological stress has significant impact on workers' health and has subsequently attracted serious attention by researchers in Europe, America and Japan¹. The proportion of females in the Taiwanese labor market increased from 33.3% in 1981 to 48.1% in 2005². A nationwide survey of employees in this country has previously identified an increasingly high level of self-perceived job stress, from 6.5% in 1994 to 13.5% in 2001, among female workers^{3,4}. In a survey of nurses from Taiwanese psychiatric institutions in 2001, 17.2% reported being always or frequently under stress at work⁵. These findings indicate that the nursing profession in Taiwan, which remains essentially a female-dominated profession, may lead to a high level of stress in female workers when compared with other occupational groups. Furthermore, nurses in Taiwan are mostly of reproductive age^{6,7}.

International research has demonstrated a significant relationship between occupational stress and its influences on the function of endocrine and reproductive health^{8–11}. Consequently, it may further lead to anovulation, amenorrhea, changes in menstrual cycles, and even affect fecundability^{12–15}. To date however, studies on the relationships between job stress, female workers' menstrual cycle change and fecundability are relatively rare in Taiwan. Investigation of the impacts of job stress on the change of menstrual patterns can help provide a better understanding of reproductive health among women. We therefore conducted a cross-sectional investigation to determine whether menstrual irregularity and abnormality were related to self-perceived work stress among nurses.

Materials and Methods

The targeted research population were nursing staff employed by five psychiatric hospitals and four general hospitals in Taiwan. The inclusion criteria were: 1) being

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female and aged 20 to 45 yr old; and 2) having worked for at least three months. Data were collected using a structured self-administered questionnaire. The Chinese Job Content Questionnaire (JCQ)¹⁵⁾ (translated from The Job Content Questionnaire)^{16, 17)} was adapted for assessing psychosocial work conditions. A focus group consisting of ten clinical nursing staff was held to ensure the appropriateness of the questionnaire describing job characteristics, job stress and menstrual patterns. Information on their menstrual patterns during the past 12 months was also requested from participants.

The assessment of menstrual patterns included the following: (1) the definition of menstrual cycle length (being the time from the first day of menstrual bleeding to the first day of the next menstrual bleeding), (2) the definition of menstrual cycle regularity (the difference between the longest and shortest menstrual cycles), and (3) the length of menstruation (time from the first day of menstrual bleeding to the cessation of menstrual bleeding). The questionnaire included four aspects: demographics, personal work situation and work history, self-perception about work, and menstrual patterns assessment. As for self-perceived stress related to work (independent variable), a four-point Likert scale was adapted, i.e. “totally disagree”, “disagree”, “agree” and “totally agree”. As for self-perceived job stress, the question “generally speaking, I feel stressed from work” was used. Self-perceived job stress was defined as answering “strongly agree” or “agree” to the following question “Generally, I feel that my job is stressful”.

The test-retest reliability (two weeks between the pretest and posttest) of Kappa value of agreement was 0.6 for the items evaluating “self-perceived job stress” (a total of 23 items, including “I have control on how to perform my tasks at work”, “I have sufficient time to finish my tasks at work”, “I am very busy at work”, “I need to handle many things at the same time”, “I am overloaded due to staff shortages”, “I feel insecure about my job (including salary and status)”, “I feel the job promotion system is unfair”, “my colleagues would help me out if needed”, “I get along with my colleagues”, etc.). The test-retest Pearson correlation (*p*-value) of “menstrual cycle length” was 0.8 ($p < 0.001$). The total score of content validity index (CVI) of this questionnaire was 0.9.

JMP statistical software (version 4.04) was used for data analysis. *T*-test and one way ANOVA were used to examine the mean difference in scales of nursing staff for both the psychiatric and general hospitals. Factor analysis was used for the construct validity of the self-perceived job stress scale. As the nursing staff of two different groups (psychiatric and

general hospitals) did not have significant differences in the patterns of menstrual changes relating to job stress level, no further individual analysis was performed for either group.

Results

A total of 1,157 questionnaires were distributed and 907 returned (78.3% response rate); 460 from psychiatric hospitals (85.8% response rate) and 447 from general hospitals (72.0% response rate). For the purposes of investigation on reproductive health outcomes, we excluded the following individuals from the analysis: (1) those younger than 20 yr or those older than 45 yr, (2) those who reported a history of thyroid diseases, (3) those with a menstrual cycle length of 45 d or longer; and (4) those with a working tenure less than 3 months. After exclusions, this left 746 eligible questionnaires for the final analysis. The mean age of participants was 29.6 and over half of them were between 25 and 35 yr old. The mean length of employment was 7.5 yr, while the average working hours per week was 41.3 h (Table 1). As for educational levels, most had an associate degree from college (69.0%), while the rest were bachelor degree holders. Most of the participants were unmarried (42.2%; $n=315$), and 35.3% had a history of pregnancy. The majority of participants (70.0%) were undertaking irregular shift work at the time of the survey. With regard to the question: “generally speaking, I feel stressed from work”, 539 (72.3%) nursing staff strongly agree with this description, while the rest (207, 27.8%) somewhat agree.

The menstrual patterns of the participants are shown in Table 2, and 13.7% ($n=102$) reported of having a menstrual cycle greater than 35 d, while the remainder 0.3% ($n=20$) had a shorter cycle of less than 24 d. Nearly half (43.3%, $n=323$) the participant nurses had poorly regulated menstrual cycles with more than 7 d between their longest and shortest period length, and a total of 252 (33.8%) nurses having an average menstruation length of longer than 7 d. Due to the possibility that oral contraceptives could have affected menstruation¹⁸⁾, the data were reanalyzed with nurses currently taking oral contraceptives ($n=2$) being excluded. After doing so however, our results were essentially the same (data not shown).

Risk factors (hereby indicated as odds ratios) for menstruation problems were evaluated using a logistic regression model, as shown in Table 3. A nurse’s menstrual cycle was considered to be abnormal if it was shorter than 24 d or longer than 35 d. Demographic variables for logistic regression analysis included: the level of self-perceived job stress, age, body mass index (BMI), marital status, history of

Table 1. Demographic characteristics of participating nurses

Variables	n	%*	Mean (SD)
Average age (yr)	746		29.6 (5.7)
Average career length (yr)	746		7.5 (5.3)
Average working week (h)	746		41.3 (3.8)
Age group (yr)			
	<25	126	16.9
	25–35	498	66.7
	>35	122	16.4
Educational level			
	Associate degree	515	69.0
	Bachelor degree	231	31.0
Marital status			
	Yes	431	57.8
	No	315	42.2
Pregnancy history			
	Yes	263	35.3
	No	483	64.7
Shift work			
	Fixed day shift	158	21.2
	Fixed evening shift	41	5.5
	Fixed night shift	25	3.3
	Irregular work shift	522	70.0
Generally speaking, I feel stressed from work			
	Strongly disagree	2	0.3
	Somewhat disagree	205	27.5
	Somewhat agree	396	53.1
	Strongly agree	143	19.2

*N=746

Table 2. Menstrual patterns of participating nurses

Variable	n	%*
Average length of menstrual cycle (d)		
	>35	102
	24–35	624
	<24	20
Regularity of menstrual cycle (d)		
	≤7	423
	>7	323
Length of menstrual bleeding (d)		
	≤7	494
	>7	252

*N=746

pregnancy, length of employment, and average work hours per week. A high level of self-perceived job stress was significantly associated with irregularity of the menstrual cycle (the difference between longest and shortest cycles were 7 d or longer)¹⁹⁾ (OR: 4.8, 95%CI: 3.3–7.1, $p<0.0001$), as well as a longer menstrual bleeding period (>7 d) (OR: 2.4, 95%CI: 1.7–3.6, $p<0.0001$). BMI did not have any impact on menstrual

patterns. However, being single, never having been pregnant and being employed for less than 5 yr was statistically associated with having a longer and irregular menstrual cycle (Table 3). In addition, nurses who worked over 40 h per week were more likely to have experienced an irregular menstrual cycle (OR: 1.5, 95%CI: 1.1–2.1, $p=0.029$).

After adjusting for self-perceived job stress, age, BMI, marital status, pregnancy history, employment and work hours, only those who perceived a high level of job stress had a statistically significant risk of irregular menstrual cycles (AOR: 4.8, 95%CI: 3.3–7.2, $p<0.001$) and having a longer menstrual bleeding period (AOR: 2.5, 95%CI: 1.7–3.7, $p<0.001$) (Table 4).

Discussion

The demographic and work characteristics of our study participants were similar to the current situation known to exist within the nursing profession of Taiwan^{20–22)}. As for the level of self-perceived job stress assessment (“generally speaking, I feel stressed from work”), nearly three quarters

Table 3. Risk factors for menstrual problems among Taiwanese nurses evaluated using logistic regression analysis (unadjusted)

Variables		Long menstrual cycle			Short menstrual cycle		Irregular menstrual cycle		Longer menstrual bleeding	
		n	OR (95% CI)	<i>p</i>	OR (95% CI)	<i>p</i>	OR (95% CI)	<i>p</i>	OR (95% CI)	<i>p</i>
Self-perceived job stress	Low	207	1.0		1.0		1.0		1.0	
	High	539	1.4 (0.9–2.3)	0.208	3.5 (1.0–22.4)	0.092	4.8 (3.3–7.1)	<0.0001	2.4 (1.7–3.6)	<0.0001
Age (yr)	>35	122	1.0		1.0		1.0		1.0	
	25–35	498	2.3 (1.2–5.4)	0.029	0.6 (0.3–2.1)	0.462	1.9 (1.3–3.0)	0.003	1.3 (0.9–2.1)	0.195
	<25	126	3.4 (1.5–8.3)	0.005	0.2 (0.1–1.2)	0.129	2.6 (1.6–4.5)	0.0003	1.0 (0.6–1.8)	0.911
Body Mass Index (kg/m ²)	19–24	448	1.0		1.0		1.0		1.0	
	<19	192	1.3 (0.8–2.1)	0.289	2.1 (0.8–5.6)	0.128	1.1 (0.8–1.6)	0.520	1.1 (0.7–1.5)	0.760
	>24	106	1.2 (0.7–2.2)	0.476	1.4 (0.3–4.9)	0.603	0.9 (0.6–1.3)	0.517	0.4 (0.3–0.7)	0.002
Marital status	Yes	315	1.0		1.0		1.0		1.0	
	No	431	1.9 (1.2–3.0)	0.005	0.9 (0.4–2.2)	0.799	1.5 (1.2–2.1)	0.004	0.7 (0.5–0.9)	0.022
Pregnancy history	Yes	263	1.0		1.0		1.0		1.0	
	No	483	1.7 (1.1–2.8)	0.028	1.0 (0.4–2.7)	0.981	1.9 (1.4–2.6)	<0.0001	0.8 (0.6–1.1)	0.246
Career length (yr)	≥5	466	1.0		1.0		1.0		1.0	
	<5	280	1.7 (1.1–2.5)	0.019	0.7 (0.2–1.8)	0.483	1.5 (1.1–2.1)	0.004	0.8 (0.6–1.2)	0.293
Weekly work (h)	≤40	587	1.0		1.0		1.0		1.0	
	>40	159	0.9 (0.5–1.5)	0.651	0.9 (0.3–2.6)	0.884	1.5 (1.1–2.1)	0.029	1.0 (0.7–1.5)	0.807

Table 4. Risk factors for menstrual problems among Taiwanese nurses evaluated using logistic regression analysis (adjusted*)

Variables		Long menstrual cycle			Short menstrual cycle		Irregular menstrual cycle		Longer menstrual bleeding	
		n	AOR (95% CI)	<i>p</i>	AOR (95% CI)	<i>p</i>	AOR (95% CI)	<i>p</i>	AOR (95% CI)	<i>p</i>
Self-perceived job stress	Low	207	1.0		1.0		1.0		1.0	
	High	539	1.4 (0.8–2.3)	0.226	3.7 (1.0–23.6)	0.081	4.8 (3.3–7.2)	<0.001	2.5 (1.7–3.7)	<0.001
Age (yr)	>35	122	1.0		1.0		1.0		1.0	
	25–35	498	2.0 (0.9–4.7)	0.097	0.5 (0.2–1.8)	0.274	1.5 (0.9–2.4)	0.105	1.5 (0.9–2.4)	0.105
	<25	126	2.2 (0.8–6.3)	0.125	0.1 (0.1–1.2)	0.101	1.7 (0.9–3.5)	0.122	1.5 (0.7–3.0)	0.282
Body Mass Index (kg/m ²)	19–24	448	1.0		1.0		1.0		1.0	
	<19	192	1.1 (0.7–1.8)	0.632	2.3 (0.8–6.4)	0.116	1.0 (0.7–1.5)	0.911	1.2 (0.8–1.7)	0.381
	>24	106	1.3 (0.7–2.4)	0.369	1.3 (0.2–4.6)	0.667	0.9 (0.6–1.5)	0.765	0.4 (0.3–0.7)	0.001
Marital status	Yes	315	1.0		1.0		1.0		1.0	
	No	431	2.1 (0.8–6.5)	0.156	0.8 (0.2–5.1)	0.767	0.7 (0.4–1.4)	0.345	0.5 (0.3–0.9)	0.030
Pregnancy history	Yes	263	1.0		1.0		1.0		1.0	
	No	483	0.7 (0.2–1.8)	0.443	1.5 (0.2–7.0)	0.623	2.0 (1.1–3.9)	0.027	1.3 (0.7–2.4)	0.465
Career length (yr)	≥5	466	1.0		1.0		1.0		1.0	
	<5	280	1.2 (0.7–2.0)	0.528	1.1 (0.3–3.2)	0.907	1.2 (0.8–1.7)	0.470	0.9 (0.6–1.3)	0.510
Weekly work (h)	≤40	587	1.0		1.0		1.0		1.0	
	>40	159	0.9 (0.5–1.5)	0.744	0.9 (0.2–2.5)	0.834	1.4 (1.0–2.1)	0.051	0.9 (0.6–1.3)	0.786

*Adjustment was performed by evaluating the variables simultaneously in a combined regression model.

(72.3%) of the participants strongly agreed with this description, indicating a higher prevalence of job stress in nurses when compared with other domestic, female work groups^{3,4}. With regard to the nurses' menstrual cycle, length of menstruation and the regularity of the general population, there is currently no published information available from domestic studies in Taiwan. Nonetheless, nurses appear to have longer menstruation days (>7 d) when compared with

other female work groups. This phenomenon, to some extent, may indicate that a high level of self-perceived job stress is statistically associated with menstruation problems in female workers, regardless of their job characteristics.

Previous studies have reported that job stress may interfere with endocrine function and biological rhythms, possibly leading to irregular menstrual cycles, change of bleeding and abnormal menstrual patterns^{11, 14, 22–26}. Although our

study identified a strong correlation between self-reported job stress and changes in menstrual patterns, we were unable to examine biological changes using a laboratory measure. Many different criteria have been previously used for measuring irregular menstrual cycles, and we adopted the methods of Smith-DiJulio and coworkers¹⁹⁾, who defined menstrual irregularity as having more than six days difference between any two consecutive menstrual cycles in the reference year.

Single and unmarried participants were more likely to have abnormal menstrual cycles when compared to married ones, and this finding is consistent with other studies. Being married may provide more support systems, thereby releasing some job stress^{21, 27, 28)}. Job stress may subsequently be reduced and thereby positively influence the regularity of menstrual cycles. In our current study, there were some confounding factors that were not investigated, including the use of contraceptives and progestin (due to a lack of detailed data in recent years). Some researchers have argued that consuming raw and cold food might have an impact on menstrual patterns^{11, 28)}, although our investigation did not specifically investigate these factors. Again, as mentioned above, we were unable to measure biological impacts in the current investigation. Nevertheless, further research is strongly recommended to combine both retrospective and laboratory measures for a better explanation of such phenomenon. Oral contraceptives are known to affect the length and regularity of menstrual cycles, and some are believed to affect hypothalamus-pituitary-adrenal responses to psychosocial stress¹⁸⁾. However, due to the low number of participants in this study currently taking oral contraceptives (n=2), when our data was reanalyzed with those participants excluded, the results were essentially the same.

This research identified a strong relationship between nurses' job stress and changes in their menstrual patterns. As female menstrual patterns are considered to be associated with reproductive health, the impacts of job stress on nurses' reproductive health warrants further investigation. In addition, an investigation of urine levels of hormone metabolites, such as estradiol, progesterone, etc. would be useful in providing more detailed information on physiological changes, including perhaps the exact date of ovulation, all of which are important biomarkers of female fecundability^{24, 28)}.

There are certain limitations of this study, which include the following: (1) the investigation was a cross-sectional survey, and thus relies on the women's recall, and (2) as the investigation was cross-sectional, definitive causal relationships could not be ascertained. For example,

menstrual problems might have caused low job performances, which consequently lead to a high level of self-perceived job stress. A prospective study with early job stress assessment, followed by the recording of a menstrual diary with daily urine hormone measurements for 3–6 months would be a useful step in future research. Nevertheless, cross-sectional research is generally more feasible and elicits greater cooperation from nurses in Taiwan, as elsewhere. With the findings of this current investigation, further cooperation from Taiwanese nurses will be more likely in future, and detailed hormonal measurements may then be possible.

Conclusion

Overall, this study suggests that nurses' self-perceived job stress may be associated with certain aspects of menstrual dysfunction. The level of self-perceived job stress was associated with a risk of irregularity in menstrual cycles and a risk of prolonged menstrual bleeding periods. Further investigations with prospective follow-up studies and urine hormonal measurements are now recommended to provide additional insight into the pathophysiological mechanisms of our findings.

References

- 1) National Institute of occupational safety and health (NIOSH), 1999. Stress at work. <http://www.cdc.gov/niosh/jobstress.html>. Accessed September 10, 2007.
- 2) Directorate-General of Budget, Accounting and Statistics, Executive Yuan (2005) Annual Report of Human Resource Survey in 1995, Directorate-General of Budget, Accounting and Statistics, Executive Yuan, Taipei.
- 3) Cheng Y, Guo YL, Yeh WY (2001) A national survey of psychosocial job stressors and their implications for health among working people in Taiwan. *Int Arch Occup Environ Health* **74**, 495–504.
- 4) Tai CF, Yang JC, Yeh WY (2002) Survey on the Employees' Perception on the Safety and Health Situations of the Work Environment, Institute of Occupational Safety & Health, Executive Yuan, Taipei.
- 5) Shen HC, Cheng Y, Tsai PJ, Lee SHS, Guo YL (2005) Work stress in nurses in psychiatric institutions in Taiwan. *J Occup Health* **47**, 218–25.
- 6) Guo L, JSC Shiao, Chuang Y-C, Huang K-Y (1999) Needlestick and sharps injuries among health care workers in Taiwan. *Epidemiol Infect* **122**, 259–65.
- 7) Shiao JSC, Koh D, Lo LH, Lim MK, Guo YL (2007) Factors predicting nurses' consideration of leaving their job during the SARS outbreak in Taiwan. *Nursing Ethics* **14**, 5–17.
- 8) Dimsdale J, Moss J (1980) Short-term catecholamine response

- to psychological stress. *Psychosom Med* **42**, 493–7.
- 9) Katz VL, Jenkins T, Haley L, Bowes WA Jr (1991) Catecholamine levels in pregnant physicians and nurses: a pilot study of stress and pregnancy. *Obst Gynecol* **77**, 338–42.
 - 10) Istvan J (1986) Stress anxiety and birth outcomes: a critical review of the evidence. *Psychol Bull* **100**, 331–48.
 - 11) Harlow SD, Ephross SA (1995) Epidemiology of menstruation and its relevance to women's health. *Epidemiol Rev* **17**, 265–86.
 - 12) Jeyaseelan L, Rao PS (1995) Effect of occupation on menstrual cycle length: causal model. *Human Biol* **67**, 283–90.
 - 13) Shortridge LA, Lemasters GK, Valanis B, Hertzberg V (1995) Menstrual cycles in nurses handling antineoplastic drugs. *Cancer Nursing* **18**, 439–44.
 - 14) Hatch MC, Figa-Talamanca I, Salerno S (1999) Work stress and menstrual patterns among American and Italian nurses. *Scand J Work Env Health* **25**, 144–50.
 - 15) Karasek RA, Theorell T, Schwartz JE, Schnall PL, Pieper CF, Michela JL (1988) Job characteristics in relation to the prevalence of myocardial infarction in the US Health Examination Survey (HES) and the Health and Nutrition Examination Survey (HANES). *Am J Public Health* **78**, 910–8.
 - 16) Tseng HP, Cheng YW (2002) "Loading-Control-Support" and "Contribution-Feedback Imbalance" of reliability and validity test of the Chinese job stress scale: using the employees of e-industry as the targets. *Taiwan Public Health Magazine* **21**, 420–31 (in Chinese).
 - 17) Cheng Y, Luh WM, Guo YL (2002) Reliability and validity of the Chinese version of the Job Content Questionnaire (C-JCQ) in Taiwanese workers. *Int J Beh Med* **10**, 15–30.
 - 18) Kirschbaum C, Kudielka BM, Gaab J, Schommer NC, Hellhammer DH (1999) Impact of gender, menstrual cycle phase and oral contraceptives on the activity of the hypothalamus-pituitary-adrenal axis. *Psychosom Med* **61**, 154–62.
 - 19) Smith-DiJulio K, Mitchell E, Woods N (2005) Concordance of retrospective and prospective reporting of menstrual irregularity by women in the menopausal transition. *Climacteric* **8**, 390–7.
 - 20) Whittington R, Wykes T (1994) Violence in psychiatric hospitals: are certain staff prone to being assaulted? *J Adv Nursing* **19**, 219–25.
 - 21) Huang JC, Huang S, Lin LM, Sun AT (2001) Exploration on the job stress and the related factors of the nursing personnel in operation room. *Chang Gung Nursing J* **12**, 1–11.
 - 22) Armstrong DT (1986) Environmental stress and ovarian function. *Biol Reprod* **34**, 29–39.
 - 23) Harlow SD, Matanoski GM (1991) The association between weight, physical activity, and stress and variation in length of menstrual cycle. *Am J Epidemiol* **133**, 38–49.
 - 24) Fenster L, Waller K, Chen J, Hubbard AE, Windham GC, Elkin E, Swan S (1999) Psychological stress in the workplace and menstrual function. *Am J Epidemiol* **149**, 127–34.
 - 25) Gordley LB, Lemasters G, Simpson SR, Yiin JH (2000) Menstrual disorders and occupational, stress, and racial factors among military personnel. *J Occup Environ Med* **42**, 871–81.
 - 26) Jeyaseelan L, Rao PS (1995) Effect of occupation on menstrual cycle length: causal model. *Human Biol* **67**, 283–90.
 - 27) Shih FF, Chou CF (2002) Exploration on the nursing personnel's job stress and responsive behavior in the drug quitting ward. *The Chung Shan Med J* **12**, 197–208 (in Chinese).
 - 28) Sundell G, Milsom I, Andersch B (1990) Factors influencing the prevalence and severity of dysmenorrhoea in young women. *Brit J Obst Gynecol* **97**, 588–9.