

## The Associations between Menstrual Function and Life Style/Working Conditions among Nurses in Taiwan

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**Abstract: The Associations between Menstrual Function and Life Style/Working Conditions among Nurses in Taiwan: Fen-Fang CHUNG, et al. Department of Nursing, Chang Gung Institute of Technology, Taiwan, R.O.C.**—This study was aimed at understanding the relationship among menstrual pattern, dysmenorrhea, life style and working conditions in nurses. The nurses were randomly selected from a medical center in Northern Taiwan. Each subject completed daily records including life and working conditions during the study period. The study showed that there were statistically significant differences in work years, daily working hours and type of work shift among nurses that worked at different units in the hospital. In the perceived regular cycle group, nurses that worked the night shift only exhibited the shortest menstrual cycles, less than 25 d. There was a significant difference ( $p < 0.05$ ) among the nurses' menstrual cycles. Many life factors (such as passive tobacco smoke exposure, perceived life satisfaction and perceived life stress) and working factors (such as work years, perceived work satisfaction and perceived work stress) were not significantly related to menstrual cycle regularity. In addition, 30% of the nurses complained of dysmenorrhea. Some factors including age, marital status and perceived life satisfaction were significantly related to dysmenorrhea. However, other life factors (such as passive tobacco smoke exposure, smoking, coffee, alcohol, cold drink habits, exercise and perceived life stress) and working factors (such as working places, type of work shift, daily work hours, perceived work satisfaction and perceived work stress) showed no correlation with dysmenorrhea. This study indicates that women should pay attention to their menstrual function and dysmenorrhea phenomenon.

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A variety of environmental stresses such as life and work pressures could interfere with endocrine functions and produce menstrual cycle disorders<sup>1–5</sup>. The total cost in lost workdays associated with menstrual dysfunction was estimated at between 94 and 308 million dollars per day lost in the USA<sup>6</sup>. Menstrual disorders might reduce women's quality of life and also cause serious economic losses related to lost workdays and decreased productivity<sup>6,7</sup>.

Many factors including age, smoking, body weight, exercise, race, life event, perceived stress, physiological condition (such as cold), work environment (work shift, noise/vibration/organic solvents exposure) are associated with changes in menstrual function<sup>1, 4, 8–13</sup>. Smoking women are at greater risk of having irregular menstrual cycles, heavy bleeding and increased clotting<sup>14, 15</sup>. In a large survey of American nurses, job stress was associated with a 3-fold increase in amenorrhea and other menstrual abnormalities<sup>7</sup>. It was found that an association between unfavorable work conditions, self-reported job stress and menstrual dysfunction occurred among female industrial workers in France<sup>16</sup>. Life event stress was significantly associated with abnormal cycle length (odds ratio=3.42) and hypermenorrhea (odds ratio=2.99) in military personnel<sup>1</sup>.

Primary dysmenorrhoea is a common gynaecological disorder reported to be related to periodic absenteeism among young women<sup>17, 18</sup>. Dysmenorrhea is significantly related to age, smoking, life event stress, menarcheal age, and menstrual bleeding time<sup>1, 14</sup>. However, no association has been found between dysmenorrhea severity and physical exercise frequency<sup>15</sup>. The frequencies of fixed/regular exercise and work strength were significantly related to menstrual discomfort for regularly menstruating women aged 25 to 39 in Taiwan. Persons that participate in less fixed and regular exercise or exert themselves too

strenuously at work had a higher rate of menstrual discomfort than those who received more exercise or worked sitting down<sup>19</sup>).

Few studies have investigated the female menstrual function and dysmenorrhea distribution in Taiwan. Therefore, a questionnaire-based study on life-style and working conditions of nurses was conducted to further evaluate the association between menstrual function and dysmenorrhea, and life and work-related factors.

## Materials and Methods

*Study location:* A medical center, Chang Gung Memorial Hospital with 3,500 beds located in northern Taiwan, was selected for this study. There were 2,800 nurses and 1,800 physicians working for this medical center. The number of inpatients, outpatients, and emergency cases in a year were approximately 1.26 million, 3.2 million, and 0.24 million, respectively. This hospital is typical of most medical centers in Taiwan that contain many departments (such as departments of medicine, surgery, pediatrics, gynecology and obstetric, and Chinese medicine).

*Study population:* All units in the hospital were classified into 5 work places: wards, emergency room (ER), intensive care units (ICU), outpatient departments (OPD), and operating theaters (OR). A sample of 15 (5 wards, 1 ER, 4 ICUs, 1 OPD and 4 ORs) was taken from 95 units of the hospital using a systemic sampling method. A total of 200 nurses was respectively recruited from the five work places and then 40 nurses were selected from each work places. The ratio of selection in each work places was 25%. All nurses had fixed employment status in their unit, were aged 21 to 44 yr and were able to provide informed consent as well as to complete questionnaires and a life/work diary. Subjects that were pregnant or planned to become pregnant were excluded from the study.

*Questionnaires:* The questionnaire collected information including participants' personal characteristics (i.e., age, religion, education, height, and weight); life style (including smoking status, passive tobacco smoking exposure, drinking behavior, drinking coffee habit, self-perceived life satisfaction, self-perceived life stress, and major stressors); and menstrual history (i.e., age of menarche, regularity of menstrual cycle, menstrual bleeding time, perceived bleeding amount, experience of dysmenorrhea and BBT measurement) during the one year that preceded the survey. The definitions of regularity of menstrual cycle were as follows: regular cycle if the answer was between 21 d and 35 d per cycle; otherwise, irregular cycle.

*Life/work diary:* Nurses recorded life/work diaries for

14 wk (3.5 months). The life diary collected the participants' daily life events including sleep hours, exercise frequency and number of cold drinks, as well as menstrual bleeding time, perceived bleeding amount and dysmenorrhea status. The work diary information included the number of patients the nurse cared for, working hours and work shift including day shift (8 am–4 pm), evening shift (4 pm–12 am) and night shift (12 am–8 am), self-perceived work satisfaction, self-perceived work stress, and major stressors. The Likert 5-point scoring methods that were reviewed and modified by six experts in gynecological/obstetric and public health fields were used to measure self-perceived work/life satisfaction and self-perceived work/life stress of nurses.

*Statistical analysis:* All data were analyzed with the SPSS for Windows statistical package (version 10.0, SPSS Institute Inc., Cary, North Carolina). Student's *t*-test, one-way analysis of variance (ANOVA) and *Chi*-square test were used to make comparisons among nurses working in the 5 work places with respect to life/work-related factors, menstrual cycles and dysmenorrhea at this hospital. The level of significance was chosen as  $p < 0.05$ . Multiple logistic regression models were constructed to estimate the strength of associations among personal characteristics/working factors, menstrual pattern, and dysmenorrhea. We defined the categories of menstrual cycle length as follows: cycle length=short cycle if the answer was less than 25 d per month; cycle length=long cycle if the answer was more than 35 d per month.

## Results

A total of 151 individuals in the 5 work places of the hospital completed questionnaires and made life/work diaries (75% response rate). The average age of the subjects in this study was 27.7 yr old (SD=5.3). There were significant differences in age, education and marital status among nurses in the different work places ( $p < 0.01$ ) (Table 1). The average age (34.8 yr old, SD=4.0) of nurses in OPD was 7 yr older than other groups. More than 90% of the nurses expressed satisfaction in their current life and 16% of those felt strong life stress, especially those nurses working in the wards and ICU. The main source of life stress was from their home, such as doing housekeeping work, taking care of family, and maintaining family relationships.

Most of the nurses had worked at least 2 yr (Table 2). The number of work years for nurses in the OPD group was more than five years. It was demonstrated that about 38% of the nurses worked for over 8 h a day. With regard to the situation of work shift, all nurses with fixed shifts had worked for at least 3 months. The cycle of rotation among nurses with rotating shift work was 30 d. Nurses who worked with rotating shifts were found in wards, ER and ICU. All nurses in OPD worked on day shift

**Table 1.** Socio-demographic characteristics of nurses

Socio-demographic characteristics	Ward (n=28)	ER (n=18)	ICU (n=34)	OPD (n=37)	OR (n=34)	Total (n=151)
Age (SD), yr <sup>§</sup>	26.3 (4.3)*	25.3 (3.2) <sup>†</sup>	24.8 (2.5) <sup>‡</sup>	34.8 (4.0)* <sup>‡@</sup>	24.9 (2.3) <sup>@</sup>	27.7 (5.3)
BW (SD), kg	52.0 (8.1)	52.0 (4.7)	52.9 (6.6)	54.4 (7.6)	52.7 (6.7)	53.0 (7.0)
BMI (SD), kg/m <sup>2</sup>	20.6 (2.7)	20.7 (2.2)	21.2 (2.7)	21.6 (2.2)	20.4 (2.4)	20.9 (2.5)
Education, %**						
High school	3.6	0	0	16.2	0	4.6
Junior college	89.3	72.2	78.8	83.8	94.1	84.7
College	7.1	27.8	21.2	0	5.9	10.7
Marital status, %**						
Single	67.9	94.4	91.2	16.2	88.3	68.2
Married	32.1	5.6	8.8	78.4	8.8	29.8
Divorced/Separated	0	0	0	5.4	2.9	2.0
Drinking coffee habit						
No	75	61.1	76.5	59.5	70.6	68.9
Yes	25	33.3	20.6	40.5	29.4	29.8
Quit	0	5.6	2.9	0	0	1.3
Passive tobacco smoke exposure, %						
No	71.4	72.2	85.3	83.8	91.2	82.1
Yes	28.6	27.8	14.7	16.2	8.8	17.9
Perceived life satisfaction, %						
Low	7.5	5.6	14.7	2.7	2.9	6.6
Medium	44.4	44.4	58.9	32.4	47.1	45.4
High	48.1	50.0	26.4	64.9	50.0	48.0
Perceived life stress, %						
None	3.6	0	0	2.7	8.8	3.3
Low	14.3	33.3	20.6	18.9	23.5	21.2
Medium	57.1	55.6	55.9	67.6	58.9	59.6
High	25.0	11.1	23.5	10.8	8.8	15.9

§: ANOVA,  $p < 0.01$ ; \*: ward vs. OPD; †: ER vs. OPD; ‡: ICU vs. OPD; @: OR vs. OPD

\*\* : Chi-square test,  $p < 0.01$

only. There were significant differences in working years ( $p < 0.01$ ), working hours ( $p < 0.05$ ) and type of working shift ( $p < 0.01$ ) among the nurses in the five work places. Ninety-two percent of the nurses in this study reported satisfaction with their work. Only 18% of the nurses perceived high work stress, and they were concentrated in the ICU and wards. The main source of work stress was from the characteristics and content of the work such as the number and severity of patients the nurse cared for, and the quantity of administrative work.

The age of menarche was between 10 and 18 yr, and the menstrual patterns of nurses showed that around 35% of the nurses had irregular menstrual cycle (Table 3). The nurses in the wards, ICU and ER perceived irregular menstrual cycles more often than the other work places. It was found that menstrual cycle length of nurses in ER was either less than 25 d or more than 35 d. Additionally, 30% of the subjects frequently complained of

dysmenorrhea. The highest and lowest percentages of regular menstrual cycles were found in nurses with fixed day shifts and night shifts, respectively (Table 4). It was found that 45.5% of nurses who worked with fixed night shifts had regular menstrual cycle, but 60% of their cycle lengths were less than 25 d. The percentage of short cycles among nurses with fixed night shifts was higher than that in the various shift group ( $p < 0.05$ ). The results indicate that menstrual cycle regularity was not significantly related to smoking, passive tobacco smoke exposure, drinking coffee/alcohol/cold drinks, taking regular exercise, perceived life satisfaction/life stress, working years, daily working hours, or perceived working satisfaction/working stress. With regard to work shift in relation to menstrual pattern in the logistic model, important factors such as age, education, marital status, and working hours were adjusted, and it was shown that menstrual regularity was not related with type of work

**Table 2.** Work characteristics of nurses

Work characteristics	Ward (n=28)	ER (n=18)	ICU (n=34)	OPD (n=37)	OR (n=34)	Total (n=151)
<b>Work years, %**</b>						
<1	3.5	5.6	2.9	0	0	2.0
1–1.9	10.7	27.8	20.6	0	17.6	13.9
2–4.9	42.9	44.4	50.0	0	55.9	37.1
>5	42.9	22.2	26.5	100	26.5	47.0
<b>Working hours, %*</b>						
<8 h/d	0	0	0	0	2.9	0.7
8 h/d	46.4	77.8	82.4	45.9	61.8	61.6
>8 h/d	53.6	22.2	17.6	54.1	35.3	37.7
<b>Type of work shift, %**</b>						
Day shift	17.9	22.2	5.9	100	70.6	47.7
Evening shift	10.7	22.2	20.6	0	8.8	11.3
Night shift	7.1	5.6	17.6	0	8.8	7.9
Rotating shift	64.3	50.0	55.9	0	11.8	33.1
<b>Perceived work satisfaction, %</b>						
Low	7.1	5.5	20.5	2.7	2.9	8
Medium	53.6	55.6	47.1	45.9	61.8	52.3
High	39.3	38.9	32.4	51.4	35.3	39.7
<b>Perceived work stress, %</b>						
None	3.6	0	2.9	2.7	2.9	2.6
Low	0	11.1	2.9	5.4	20.6	7.9
Medium	71.4	72.2	67.7	73.0	73.6	71.6
High	25.0	16.7	26.5	18.9	2.9	17.9

\*: *Chi-square test, p*<0.05; \*\*: *Chi-square test, p*<0.01

**Table 3.** Menstrual patterns of nurses

	Ward (n=28)	ER (n=18)	ICU (n=34)	OPD (n=37)	OR (n=34)	Total (n=151)
Age of menarche (SD), yr	13.6 (1.4)	13.2 (1.3)	13.1 (1.5)	13.5 (1.3)	13.4 (1.1)	13.4 (1.3)
<b>Cycle regularity, %</b>						
Regular cycle	54.2	60.0	56.3	75.7	71.4	64.7
Irregular cycle	45.8	40.0	43.7	24.3	28.6	35.3
<b>Cycle length with regular cycle</b>						
Mean (SD), days	23.5 (11.0)	24.3 (12.4)	25.8 (8.0)	25.4 (8.9)	28.6 (2.4)	25.8 (8.4)
Short cycles, %	23.1	25.0	22.2	14.3	5.0	16.1
Long cycles, %	0	0	0	0	0	0
Bleeding time (SD), days	5.7 (1.7)	5.5 (1.0)	5.8 (1.8)	5.6 (2.0)	6.0 (4.2)	5.8 (2.5)
<b>Perceived bleeding amount, %</b>						
Medium	64.3	55.6	55.9	48.6	64.7	57.6
Large	35.7	44.4	44.1	51.4	35.3	42.4
<b>Dysmenorrhea, %</b>						
No	21.4	27.8	32.4	51.4	14.7	30.5
Seldom	42.9	38.9	41.1	29.7	47.1	39.7
Always	35.7	33.3	26.5	18.9	38.2	29.8

**Table 4.** Associations between type of work shift and menstrual pattern among nurses

Menstrual pattern	Day shift (n=72)	Evening shift (n=17)	Night shift (n=12)	Rotating shift (n=50)	Total (n=151)
Cycle regularity, %					
Regular cycle	72.7	68.7	45.5	54.8	64.4
Irregular cycle	27.3	31.3	54.5	45.2	35.6
Cycle length with regular cycle					
Mean (SD), days	26.7 (7.8)	26.8 (7.6)	22.6 (11.2)	24.4 (9.6)	25.8 (8.4)
Short cycles, %*	10.4	9.1	60.0	21.7	16.1
Long cycles, %	0	0	0	0	0

\*: Chi-square test,  $p < 0.05$ **Table 5.** Associations among dysmenorrhea, menstrual pattern, and life/working conditions

Menstrual pattern, and life/ working conditions	Dysmenorrhea		
	No (n=46)	Seldom (n=59)	Always (n=46)
Age (SD), yr§	30.2 (6.1) <sup>‡‡</sup>	26.9 (4.6) <sup>†</sup>	25.9 (3.9) <sup>‡</sup>
BW (SD), kg	54.8 (6.9)	52.5 (7.7)	51.8 (6.0)
BMI (SD), Kg/m <sup>2</sup>	21.7 (2.5)	20.8 (2.7)	20.4 (2.0)
Marital status, %**			
Single	48.9	74.6	79.5
Married	51.1	25.4	15.9
Divorced/Separated	0	0	4.5
Age of menarche (SD), yr	13.6 (1.2)	13.4 (1.5)	13.1 (1.2)
Bleeding time (SD), days	5.6 (1.8)	5.7 (3.4)	6.0 (1.8)
Perceived bleeding amount, %			
Medium	64.4	66.1	40.9
Large	35.6	33.9	59.1
Cycle regularity, %			
Regular	73.8	63.5	57.1
Irregular	26.2	36.5	42.9
Cycle length with regular cycle			
Mean (SD), days	24.7 (9.4)	26.9 (7.7)	25.8 (8.5)
Short cycles, %	11.5	3.4	8.7
Long cycles, %	0	0	0
Passive tobacco smoke exposure, %			
No	80.0	79.7	86.4
Yes	20.0	20.3	13.6
Perceived life satisfaction, %*			
Low	0	10.1	9.4
Medium	37.8	49.2	46.5
High	62.2	40.7	44.1
Perceived life stress, %			
None	2.2	6.8	0
Low	13.3	22.0	29.5
Medium	66.7	54.2	56.8
High	17.8	17.0	13.7

§: ANOVA,  $p < 0.01$ ; †: no vs. seldom; ‡: no vs. always\*: Chi-square test,  $p < 0.05$ ; \*\*: Chi-square test,  $p < 0.01$ 

(continued on next page)

**Table 5.** Associations among dysmenorrhea, menstrual pattern, and life/working conditions (continued)

Menstrual pattern, and life/ working conditions	Dysmenorrhea		
	No (n=46)	Seldom (n=59)	Always (n=46)
Work place, %			
Ward	13.4	20.4	22.8
ER	11.1	11.9	13.5
ICU	22.2	23.7	20.5
OPD	42.2	16.9	15.9
OR	11.1	27.1	27.3
Type of work shift, %			
Day shift only	60.0	44.0	40.9
Evening shift only	6.7	11.9	15.9
Night shift only	2.2	11.9	6.8
Rotating shift	31.1	32.2	36.4
Perceived work satisfaction, %			
Low	2.2	8.5	11.4
Medium	51.1	54.2	52.2
High	46.7	37.3	36.4
Perceived work stress, %			
None	2.2	3.4	2.3
Low	6.7	10.2	6.8
Medium	75.6	67.8	72.7
High	15.5	18.6	18.2

\*: *Chi-square test,  $p < 0.05$* ; \*\*: *Chi-square test,  $p < 0.01$*

shift (odds ratio (OR)=1.108,  $p=0.65$ ).

Young single nurses or those with lower body weight/BMI complained more of dysmenorrhea (Table 5). It was found that dysmenorrhea was related to age ( $p < 0.01$ ), marital status ( $p < 0.01$ ), and perceived life satisfaction ( $p < 0.05$ ) among nurses. However, no positive association was found between dysmenorrhea and passive tobacco smoke exposure, drinking coffee/alcohol/cold drinks, and taking regular exercise. There was no association between dysmenorrheal risk and working conditions such as work place, type of work shift, perceived work satisfaction, and perceived work stress. In the logistic models that estimated the associations between dysmenorrheal risks and life/working conditions, important factors such as age, marital status, perceived life satisfaction, type of work shift, and work satisfaction were considered. These models demonstrated a strong association between increased risk for dysmenorrhea and age ( $p=0.002$ ), but not between dysmenorrhea and type of work shift ( $p=0.227$ ). It was shown that for every decrement of one year of age in nurses, an increased risk of 2.96 (OR) for dysmenorrhea was observed when adjusting for marital status, perceived life satisfaction, type of work shift, and work satisfaction.

## Discussion

This report evaluated the menstrual function and prevalence of dysmenorrhea among nurses in a health care setting in the subtropical Taipei area, and we attempted to address the associations between various life/working factors and menstrual function/dysmenorrhea.

Psychological stress might activate corticotropin release in the nervous system leading to menstrual dysfunction<sup>20, 21</sup>. Environmental stress could interfere with a variety of endocrine profiles, especially a lowering of gonadotropin and estrogen secretion suggesting hypothalamic involvement<sup>22</sup>. However, increased prolactin secretion<sup>23</sup> might be associated with variations in the length of the menstrual cycle, anovulation, duration and the amount of menstrual bleeding<sup>2-5</sup>. There was no association among life/working stress, menstrual cycle regularity and length, menstrual duration, as well as menstrual bleeding amount, and this result was not consistent with previous studies<sup>1, 5, 7, 16, 23</sup>. Such a discrepancy could be attributed to: 1) nurses might be more capable of releasing their work stress through different ways such as talking to their friends or family and traveling or 2) the level of stress among nurses was

under the threshold that influences the menstrual function. We suggest that a life and working stress scale for nurses be developed in the future for accurate evaluation of the stress influence on changes of nurses' menstrual cycles.

Several previous studies have indicated that there is no significant relationship between work shift and menstrual cycle length<sup>5, 8, 12</sup>. However, in our current evaluation, 60% of the nurses with regular menstrual cycles and fixed night shifts had a menstrual cycle length of less than 25 d. This was significantly different from nurses who worked other shifts ( $p < 0.05$ ). The observed differences in cycle length between nurses with night shifts or other shifts might be in part attributable to the regulation of endocrine at nighttime. The relationship between night shift work and short cycle length among nurses deserves further attention.

Around 70% of the nurses complained of occasional or frequent dysmenorrhea in this study. Most of the nurses that complained of dysmenorrhea were single. There was a significant relationship between dysmenorrhea and age ( $p < 0.01$ ). This finding is similar to that of a previous study<sup>15</sup>. In addition, nurses with dysmenorrhea had both lower body weight and BMI. The inter-relationship between dysmenorrhea and lower body weight/BMI among females deserves further attention. Our results indicate that there was no positive association among age of menarche, bleeding days during menstruation and dysmenorrhea. This result is inconsistent with a previous study<sup>15</sup>.

Until now, few studies have investigated both the changes of menstrual function and dysmenorrhea among nurses in Taiwan. This study first tried to establish a basic dataset on menstrual cycle variations and prevalences of dysmenorrhea among nurses in a medical center. The factors of life-style and working condition that influenced menstrual cycles and dysmenorrhea were also examined in our study. Only one medical center was studied in our current investigation. We will consider collecting data from more hospitals in a future study. Every woman should pay attention to her menstrual function including regularity of menstrual cycle and dysmenorrhea phenomenon.

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