Menstrual Cycle and Menstrual Pain Problems and Related Risk Factors among Japanese Female Workers

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Abstract: Women's employment in Japan has increased substantially in recent decades, however little large scale research has been done on the impact of various types of working conditions on women's health. The aim of this study was to assess the menstrual cycle and menstrual pain problems of female workers and to investigate the factors that relate to them. The questionnaire was distributed to 8,150 women and 2,166 responded (26.6%). An anonymous self-administered questionnaire was used to get information about demographics, menstrual cycle status, the degree of menstrual pain, and employment and environmental factors. Irregular cycle menstruation was experienced in 17.1% of responded workers. We discovered the relationship between irregular menstrual cycles and stress, smell of cigarettes, age and smoking habits. Some degree of menstrual pain was experienced in 77.6% of responded workers. This study showed the relationship between menstrual pain and stress, high temperature and humidity, age, BMI, and number of births. In conclusion, we found that stress is thought to be an important factor related with menstrual cycle irregularities and menstrual pain among Japanese female workers.

Key words: Menstrual cycle, Menstrual pain, Female workers, Japanese, Stress

Introduction

The number of women employees have been increasing in Japan since the Equal Employment Opportunity Law was established in 1985. The law has led women to work in a broad range of jobs[1] and in various work-

ing style such as part-time work, temporary work, outsourcing, and contract employment. In addition to these social factors, aging and the low birth rate society have affected women's participation in the workforce. The "Committee for the Well-Being of Female Workers", established by the Japan Association for the Advancement of Working Women under the Ministry of Health, Labor, and Welfare, carried out a survey on maternity health care of Japanese female workers. The

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Ministry drafted the "Maternity Health Care Guide" and the "Maternity Health Care Guide Manual[2])" both of which have served as guidelines for the healthcare of working mothers. However the subjects of this survey included only pregnant or parturient women, and investigation of their menstrual cycle irregularities and menstrual pain were limited. Reports on maternity health care and occupational diseases of female workers from several countries have recently been found[3, 4]. However, the published reports on the prevalence of menstrual cycle irregularities and menstrual pain complaints among female workers and on the factors within the working environment affecting such problems are a few in Japan and most of them covers only nurses[5]. The purpose of this study was to assess the menstrual cycle and menstrual pain problems of female workers and to investigate the factors that are related to these.

Subjects and Methods

Subjects

We studied 1,470 companies, 160 of which are members of the Industrial Health Promotion Study Committee and the remaining 1,310 having over 300 employees of which more than 30% are female workers, were selscted from the publicly accessible Teikoku Data Bank database (Teikoku Data Bank Ltd., Tokyo, Japan) containing approximately 920,000 companies. Self-administered questionnaires were sent to all occupational healthcare staffs and each healthcare staff distributed the questionnaires to 5 to 10 female workers in their company, totaling 8,150 female workers. Completed anonymous questionnaires were directly sent back to the Japan Association for the Advancement of Working Women.

Methods

The questionnaire consists of demographic characteristics, employment and environmental factors, pattern of menstrual cycle, the level of menstrual pain, and life-style-related factors including age, height, body weight, number of pregnancies and births, smoking and drinking habits, and sleeping habit. Smoker or smoking habit at risk was defined as smoking one or more cigarettes per day. Drinker or drinking habit at risk was defined as consuming any alcoholic drink at least once a week. Work environmental factors were self assessed by asking "Do you feel discomfort with these factors?"

Criteria for categorization of subjects for occurrence of menstrual irregularities and menstrual pain, including employment and environmental factors are shown in Table 1. Subjects who responded to having very serious or serious pain in the questionnaire were categorized as those having menstrual pain.

Statistical methods

The χ^2 test was used for categorical comparisons of data. Difference of the means were tested by the Student's t-test. All tests were two-tailed and a $p<0.05$ was considered to indicate a statistically significant difference. Forward stepwise multiple logistic-regression analysis was applied to identify important risk factors for menstrual cycle irregularities or menstrual pain (Table 1). At the starting step statistically significant factors from the univariate analysis were included in a regression model as independent variables. Table 5 shows odds ratios and 95% confidence intervals. Subjects with incomplete data were excluded from the multiple logistic-regression analyses. Menopausal women and women equal or over the age of 45 were excluded from the analysis of "menstrual cycle/menstrual cycle irregularities". Menopausal women were excluded from the analysis of "Menstrual pain". All statistical analyses were performed on a personal computer with the statistical package SPSS 11.5 for Windows.

Results

The questionnaire was distributed to 8,150 women of which 2,166 responded (26.6%) from wide age range (Tables 2 and 3). Over half of all female workers surveyed, that was 60.4%, had never experienced pregnancy or child birth while 13.4% were smokers and 43.0% were drinkers. Sleeping duration of 6–7 h was the most common (42.6%). Daily working hours, inclusive of commuting time, was most common at 8–9 h (40.9%). Most subjects were tenured regular employees (87.4%), worked only during the daytime (95.2%), involved in clerical work (69.7%), and 71% responded that they were "extremely" or "very" stressful.

Table 4 shows the distribution of menstrual cycle irregularities and menstrual pain levels. A total of 70.0% responded that their menstrual cycle were normal, 17.1% were irregular, and 12% were menopausal. Menstrual cycle irregularities were most common among females who were under the age of 25 (26.2%), followed by those who were 25–29 yr of age (21.5%). In addition, 55.9% of women under the age of 25 and 41.3% of those aged 25–29 yr who experienced menstrual cycle irregularities had not undergone treatment for their menstrual cycle irregularities.

Concerning the prevalence of menstrual pain levels, 2.8% of female workers responded that they have "very serious pain", 25.8% "serious pain", and 49.7% responded that "the pain could be tolerated". Over half

Table 1.   Criteria for categorization of subjects for occurrence of menstrual cycle irregularities or menstrual pain

	at risk	no risk
Age	1 yr	
BMI	<18.5 25.0<	18.5–25.0
Number of pregnancies	1≤	0
Number of births	1≤	0
Smoking habits	yes	no
Drinking habits	yes	no
Sleeping hours	<6 h	6 h≤
Size of the companies (number of workers)	<50	50≤
Percentage of females in the workplace	<10%	10%≤
Working hours (including commuting time)	<9 h	9 h≤
Employment status	part-time employees temporary workers other	regular employees
Work style	early morning latenight shift	only daytime
Type of occupation	professional technical work other	clerical work
Posture when working	other	sitting
Nature of work (multiple answers)		
handling of heavy loads	yes	no
cannot leave during the course of work	yes	no
vibration	yes	no
use of organic solvents	yes	no
processing of small thing	yes	no
face-to-face work	yes	no
use of computers	yes	no
use of large machines	yes	no
not applicable	yes	no
Work environment (multiple answers)		
noise	yes	no
dust	yes	no
high temperature and humidity	yes	no
low temperature	yes	no
drying	yes	no
ventilation	yes	no
bad scaffold	yes	no
smell of cigarettes	yes	no
other	yes	no
nothing in particular	yes	no
Stress	extremely stressful very stressful	somehow stressful very little stress no stress

Table 2. Characteristics of the study subjects (Lifestyle-related factors)

		n	%
Age			
	<25	225	10.4
	25–29	506	23.4
	30–34	380	17.5
	35–39	289	13.3
	40–44	229	10.6
	45–49	212	9.8
	50–54	199	9.2
	55≤	116	5.4
	no answer	10	0.5
BMI			
	<18.5	1,586	73.2
	18.5–25.0	409	18.9
	25.0≤	125	5.8
	no answer	46	2.1
Number of pregnancies			
	0	1,277	59.0
	1≤	877	40.5
	no answer	12	0.6
Number of births			
	0	1,309	60.4
	1≤	832	38.4
	no answer	24	1.1
Smoking habits			
	yes	290	13.4
	no	1,736	80.1
	quit	132	6.1
	no answer	8	0.4
Drinking habits			
	yes	931	43.0
	no	1,211	55.9
	no answer	24	1.1
Sleeping hours			
	<5 h	173	8.0
	5–6 h	782	36.1
	6–7 h	923	42.6
	7–8 h	264	12.2
	8 h≤	16	0.7
	no answer	8	0.4

Table 3. Characteristics of the study subjects (Employment factors)

		n	%
Size of the companies (number of workers)	≤49	344	15.9
	50–99	254	11.7
	100–299	434	20.0
	300–4,999	439	20.3
	500–999	297	13.7
	1,000≤	374	17.3
	no answer	24	1.1
Percentage of females in the workplace	<10%	224	10.3
	10–30%	536	24.7
	30–50%	657	30.3
	50%≤	698	32.2
	no answer	51	2.4
Working hours	<7 h	89	4.1
	7–8 h	471	21.7
	8–9 h	886	40.9
	9–10 h	462	21.3
	10 h≤	250	11.5
	no answer	8	0.4
Employment status	regular employees	1,893	87.4
	part-time employees	132	6.1
	temporary workers	63	2.9
	other	77	3.6
	no answer	1	0.0
Work style	only daytime	2,063	95.2
	early morning or latenight shift	78	3.6
	no answer	25	1.2
Type of occupation	clerical work	1,509	69.7
	professional or technical work	379	17.5
	other	247	11.4
	no answer	31	1.4
Posture when working	sitting	1,473	68.0
	other	653	30.1
	no answer	40	1.8
Nature of work (multiple answer)	handling of heavy loads	84	3.9
	cannot leave during the course of work	150	6.9
	vibration	22	1.0
	use of organic solvents	43	2.0
	processing of small thing	87	4.0
	face-to-face work	470	21.7
	use of computers	1,761	81.3
	use of large machines	14	0.6
	not applicable	117	5.4
	no answer	7	0.3
Work environment (multiple answer)	noise	139	6.4
	dust	50	2.3
	high temperature and humidity	230	10.6
	low temperature	281	13.0
	drying	392	18.1
	ventilation	670	30.9
	bad scaffold	17	0.8
	smell of cigarettes	204	9.4
	other	152	7.0
	nothing in particular	803	37.1
	no answer	63	2.9
Stress	extremely stressful	344	15.9
	very stressful	1,193	55.1
	somehow stressful	360	16.6
	very little stress	248	11.4
	no stress	10	0.5
	no answer	11	0.5

Table 4. Distribution of menstrual cycle irregularities and menstrual pain levels

	n	%
Menstrual cycle		
normal menstrual cycle	1,516	70.0
irregular menstruation	371	17.1
menopausal	260	12.0
no answer	19	0.9
Menstrual pain		
very serious	54	2.8
serious	492	25.8
tolerable	913	47.9
none	412	21.6
no answer	35	1.8

Table 5. The relation between menstrual problems and employment or lifestyle factors

	odds ratio	95%CI
Irregular menstrual cycle		
smell of cigarettes	1.74	(2.57–1.18)
stress	1.51	(2.06–1.10)
age	0.95	(0.97–0.93)
BMI	1.30	(1.72–0.98)
smoking habits	2.22	(3.10–1.59)
sleeping hours	1.25	(1.62–0.96)
Menstrual pain		
high temperature and humidity	0.69	(0.99–0.48)
stress	1.46	(1.87–1.13)
age	0.94	(0.96–0.93)
BMI	1.42	(1.80–1.12)
number of births	0.70	(0.94–0.52)
drinking habits	1.19	(1.48–0.96)

of the subjects (64.8%) who responded to "very serious pain" consulted an obstetrician or a gynecologist, while 82.3% of those to "serious pain" and 42.5% of those to "tolerable pain" took nonprescription medicine. Similar to menstrual cycle irregularities, the percentages of subjects with menstrual pain symptoms were higher in the younger age groups.

Table 5 shows the relationship between menstrual problems and employment or lifestyle factors. Factors showing a significant relation with irregular menstrual cycles were stress, smell of cigarettes, age and smoking habits. Factors showing a significant relation with menstrual pain were stress, high temperature and humidity, age, BMI, and number of births. Incidence of menstrual cycle irregularities and menstrual pain increased among women who felt stress, but decreased with each one year age-increment.

Discussion

We intended to assess the menstrual cycle and menstrual pain problems of female workers and to determine the factors that relate to these problems in female workers. Concerning the analysis of such relationship, there have been only a few reports[6–10] in Japan and those are only among nurses. Our study was the first large-scale cross-sectional study in Japan with subject from various type of occupations to examine such relationship. We assessed the effects of work or environmental factors which may be related to problems experienced by women on menstrual cycle and menstrual pain.

Our study showed that menstrual cycle irregularities were related to stress, smell of cigarettes, age and smoking habits.

It seems that these women who felt discomfort from the smell of cigarettes were probably sensitive to odors and thus more prone to dysfunction of the central nervous system. Dysfunction of the central nervous system (diencephalic/pituitary) can be a causal factor of menstrual cycle irregularities[11].

In addition, Uehata[8] showed that women who worked night shifts tend to report more irregular menstrual cycles. Miyauchi[9, 10] reported that night shifts or irregular shift hours significantly affect the menstrual cycles of female workers. Tottedell[12] reported that an increase in the frequency of irregular night shift prolonged the menstrual cycle in nurses. Even among women who do not work at night, irregular work hours affected the menstrual cycles of women who worked in French butchering and canning factories[13]. We got contradictory results showing no relationship between work style and menstrual cycle irregularities. It is possible that effects of shift work on endocrine function will differ by the shift pattern. Some of our study subjects, who had duty in shift work, engaged in early morning shifts as opposed to Tottedell's night shift workers. This may explain the inconsistency between the results.

Muramatu[6] compared the menstrual cycle status of women at student time with the status at 3 months after they started working as nurses. They showed that women, after starting their career, tend to have a higher frequency of menstrual cycle irregularities. Another study[7] that assessed the menstrual cycles of students and nurses under the age of 25 showed that nurses had a higher frequency of amenorrhea, irregular bleeding, and extended or shortened menstrual cycles. In addition, some study[14, 15] showed that stress was related with menstrual cycles. We also showed that stress was related with menstrual cycle irregularities. Stress activates the release of corticotrophin in the nervous system leading to menstrual cycle irregularities, and interferes

with a variety of endocrine profiles, especially lowering gonadotropin and estrogen secretion[11]. Our study supported the hypothesis that stress has a significant effect on menstrual cycle irregularities.

Our study also showed that menstrual pain was related to stress, high temperature and humidity, age, BMI, and number of births.

Uehata[8] and others[16–18] reported a higher frequency of menstrual pain among women who worked on night shifts or on other shifts when compared with those who worked regularly during the daytime only. On the other hand, Chinese women who worked in 3-shift cycle at a cotton factory did not find any relation between shift work and menstrual pain[19]. We also did not find any relation between working style and menstrual pain. Similar to menstrual cycle irregularities, the nervous system and endocrine function are related to menstrual pain[11]. However, the intensity of pain that is felt depends on individual sensitivity, therefore the relationship between the nervous system or endocrine function and menstrual pain level tends to be unclear.

Our study showed that high temperature and humidity and stress had an effect on menstrual pain. Some studies have shown that menstrual pain may be related to exposure to cold air[20, 21], lifting of heavy loads[21, 22], stress and other factors.

Therefore, our results are consistent with those of previous studies in relation to high temperature and humidity and stress.

Stress was the only factor showing a significant relationship with both menstrual cycle irregularities and menstrual pain after controlling other factors. Furthermore, numerous studies have previously shown a significant relationship between stress and menstrual problems in small and/or specific types of occupation. Our results from this large scale study are consistent with previous studies, indicating that stress is an important factor affecting menstrual cycle irregularities and menstrual pain.

There are several limitations to our study. Our study was a cross-sectional study without a control group. Therefore, we were unable to identify a causal relationship between menstrual problems and life-style or work factors. In addition, stress in our study was evaluated by self-reported stress level and may differ in some way from the stress affecting endocrine function. Future studies that can address a causal relationship should be warranted, and appropriately assess the stress levels of female workers should be conducted to give a more conclusive result.

Lastly, women who have menstrual problems do not take tertiary care in our study. Accordingly, occupational health staff may need to take measures to expose these women to the knowledge about menstrual problems and help them find ways to take tertiary care.

Conclusion

Our study showed that stress was thought to be an important factor related to menstrual cycle irregularities and menstrual pain complaints among Japanese female workers.

Acknowledgements

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