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Associations of menopausal symptoms with job-related stress factors in nurses in Japan

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ABSTRACT

Objective: The main objective was to ascertain the typical menopausal symptoms and job-related stress factors in Japanese nurses during the menopausal transition, and the associations of menopausal symptoms with job-related stress. A supplementary objective was to determine whether there were any differences in menopausal symptoms and job-related stress factors among nurses in managerial positions.
Methods: One thousand seven hundred female registered nurses aged 45–60 years who were working in hospitals in Japan were asked to complete a self-administered survey that included Greene's Climacteric Scale and the Brief Job Stress Questionnaire.
Results: The proportions of nurses who reported feelings of tiredness, irritability and difficulty in concentration were higher than the proportions with other menopausal symptoms. The proportions of nurses reporting feeling unhappy or depressed and having crying spells were higher among nurses in managerial positions than among other nurses. Stresses related to 'quantitative overload' on the Brief Job Stress Questionnaire among nurses in managerial positions were significantly greater than among nurses not in managerial positions, while stresses related to 'physical overload', 'job control', 'skill discretion', 'workplace environment' and 'job satisfaction' among nurses not in managerial positions were significantly greater than they were among nurses in managerial positions. Psychological symptoms were significantly correlated with poor job-related interpersonal relationships.
Conclusions: Health care practitioners should be aware that menopausal symptoms are associated with job-related stress during the menopausal transition. Information on the differences in these associations between nurses in managerial positions and other nurses is important as it will allow their health care to be managed on a more individual basis.

1. Introduction

Menopausal symptoms are attributed to hormonal changes but are also influenced by psychological stress due to social factors in the home and workplace. Indeed, job-related stress is an increasingly important factor because of the rising number of menopausal women in the workplace. There are complex interrelationships between job-related stress and menopausal symptoms. In a cross-sectional study of Egyptian middle-aged female teachers, Hammam et al. found that the menopausal symptoms the women viewed as affecting their capacity for work and their performance were tiredness, sleep disturbance, poor memory and concentration and depressed mood [1]. In addition, the presence of various menopausal symptoms such as poor concentration and memory, tiredness, vasomotor symptoms, psychological symptoms and somatic symptoms have been shown to be associated with work efficiency, personal relationships and family relations, as well as quality of life [2–4].

Nursing has a high proportion of shift work [5] and is perceived as a very stressful occupation [6,7]. It has been suggested that the job stress of shift workers is greater than that of day workers [8,9]. Additionally, Harada et al. reported that shift-related job stress is an important contributor to health problems [10]. Unsurprisingly, chronic job-related stress in nurses is associated with low job satisfaction [6,11]. Furthermore, Faragher et al. showed in a

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meta-analysis that the level of job satisfaction was strongly associated with mental problems [12]. It therefore seems that job-related stress affects both the mental and the physical health of nurses. The physical and mental health of nurses might, in turn, affect the amount of time they have off work as well as the quality of care they provide and so patient satisfaction [13].

The labor force participation rate of women at the menopausal transition was 72.7% in 2013 in Japan [14]; the proportion of working nurses at the menopausal transition was 42.5% [15]. Therefore, a study focusing on nurses at the menopausal transition is important. However, there have been few studies of menopausal symptoms among nurses. Recently, it was reported that the frequencies of menopausal symptoms such as fatigue, irritability and arthralgia were high in middle-aged nurses compared with a community population [16]. Furthermore, nurses in managerial positions (e.g. directors of a nursing department and head nurses) face particularly high levels of job-related stress [17]. This might mean that they experience menopausal symptoms that differ in type or degree from those of nurses who are not in managerial positions. To the best of our knowledge, this hypothesis has not been tested.

We investigated menopausal symptoms and job-related stress in Japanese registered nurses at the menopausal transition. In addition, we investigated differences in menopausal symptoms and job-related stress among nurses in managerial positions and those not in managerial positions.

2. Subjects and methods

This study was conducted from September to December 2013. We first asked public and private hospitals in Japan whether they could assist with our research. Twenty-six public hospitals and two private hospitals agreed to cooperate. From these, a total of 1700 female registered nurses, including 850 nurses in managerial positions, aged 45–60 years, were invited to participate in the study. We defined managerial position as director of a nursing department or head nurse. Participants were informed of the purposes and procedure of the study in the invitation letter.

2.1. Questionnaire

We designed a self-administered questionnaire consisting of three parts. It took about 20 min to complete. The first part had questions on sociodemographic factors, lifestyle and medical history. It covered age, height and weight, marital status, menstrual and menopausal status, drug treatment, smoking, alcohol intake and living environment. Respondents were classified as premenopausal (regular menstrual cycle during the past 12 months), perimenopausal (irregular menstruation during the past 12 months) and postmenopausal (no menstruation during the past 12 months).

The second part of the questionnaire reproduced Greene's Climacteric Scale, which measures the extent to which an individual is affected by menopausal symptoms. The scale lists 21 symptoms, and participants record "not at all", "a little", "quite a bit" or "extremely" [18]. The list includes psychological, somatic and vasomotor symptoms, and loss of sexual interest is also assessed.

The third part consisted of questions on occupation, including job rank, years of nursing experience and frequency of night shifts. Job-related stress factors were assessed in this part through the Brief Job Stress Questionnaire, which was provided by the Ministry of Labour in Japan [19]. There were 17 questions in 9 categories, which were quantitative overload, qualitative overload, physical overload, job control, skill discretion, interpersonal relationships, workplace environment, job fitness and satisfaction with work. A response of "Yes", "Yes to some extent", "Not really" or "No" was given to the following 17 statements: (1) You have to do an enormous amount of work, (2) You cannot complete all of your work in the allotted time, (3) You have to work very hard, (4) You have to focus your attention quite a lot, (5) You do a difficult job that requires a high level of knowledge and skill, (6) You have to constantly think about work during your working hours, (7) You do a lot of physical work, (8) You can work at your own pace, (9) You can decide the order in which you do your work and the way you do it, (10) You can express your own opinions on the workplace strategy, (11) You do not frequently use your skills and knowledge in the job, (12) There are differences of opinion within your department, (13) Your department does not get on well with other departments, (14) The atmosphere in your workplace is friendly, (15) The environment of your workplace (noise, light, humidity and ventilation) is not so good, (16) The content of your work suits you, and (17) You have job satisfaction in your work. Some items were scored in reverse, such that lower scores consistently indicated higher degrees of job-related stress.

All the study data were generated from this self-administered questionnaire. The Ethics Committee of Tokushima University Hospital approved the study (number 1772).

2.2. Statistical analysis

Baseline characteristics such as age and BMI are presented as means ± standard deviation. Each category variable is expressed as the number of nurses and their percentage of the sample. Scores on Greene's Climacteric Scale among the pre-, peri- and postmenopausal groups of women are presented as medians with 25th and 75th percentiles. The significance of differences in variables other than age and BMI was evaluated by the chi-square test. We used the Mann–Whitney U test to determine the differences in menopausal symptoms between nurses in management positions and the other nurses. The differences in menopausal symptoms and job-related stress factors across the pre-, peri- and postmenopausal groups were evaluated by the Kruskal–Wallis rank test. Correlations between Greene's scores and scores on job-related stress factors were determined using Spearman's rank order correlation analysis. All p values are two-tailed and those less than 0.05 are considered to be statistically significant. Statistical analyses were carried out using SPSS version 21 for Windows.

3. Results

The overall response rate was 77.4% (1316/1700). We excluded incomplete questionnaires ($n = 26$) and we excluded women outside the age range in the inclusion criteria ($n = 15$) and pregnant woman ($n = 1$). In addition, women were excluded who had taken medications that might mask menopausal symptoms, including hormone replacements ($n = 13$), antidepressant or anti-anxiety drugs ($n = 13$), and thyroid hormone and anti-thyroid drugs ($n = 50$). Women with coronary heart disease ($n = 14$) and rheumatoid arthritis ($n = 15$) were also excluded. Thus, questionnaires from 1169 nurses were used for analysis. The numbers in the tables vary due to missing values in the answer column. Of the final sample, 44.0% (514/1169) were in managerial positions.

The background characteristics of the nurses are shown in Table 1. The nurses in managerial positions had more years of nursing experience than the other nurses. The frequency of night shifts tended to be higher in the group not in managerial positions. Of the 1169 nurses, 81 had had menopause induced by surgery (i.e. total hysterectomy or oophorectomy). We did not include these nurses in the pre-, peri- and postmenopausal categorization. The numbers of nurses in the pre-, peri- and postmenopause groups were 338 (28.9%), 219 (18.8%) and 531 (45.4%), respectively, and there was

Table 1
Baseline characteristics of the subjects.

		All nurses (n = 1169)	Nurses with managerial positions (n = 514)	Nurses without managerial positions (n = 655)	p value
Age (years)[a]		51.2 (4.2)	51.5 (4.1)	51.0 (4.3)	0.054
Body mass index (kg/m^2)[a]		22.4 (3.2)	22.3 (3.0)	22.5 (3.3)	0.839
Years of nursing experience (years) (No, %)	≦9	66 (5.7)	5 (1.0)	61 (9.3)	<0.001
	10–19	80 (6.8)	14 (2.7)	66 (10.0)	
	≧20	1021 (87.3)	494 (96.1)	527 (80.5)	
	Unknown	2 (0.2)	1 (0.2)	1 (0.2)	
Job performance (No, %)	Full time	1061 (90.7)	511 (99.4)	550 (84.0)	<0.001
	Part time	106 (9.1)	2 (0.4)	104 (15.8)	
	Unknown	2 (0.2)	1 (0.2)	1 (0.2)	
Presence of night shift (No, %)	Yes	863 (73.8)	371 (72.2)	492 (75.1)	0.282
	No	304 (26.0)	142 (27.6)	162 (24.7)	
	Unknown	2 (0.2)	1 (0.2)	1 (0.2)	
Frequency of night shift (/month) (No, %)	≦3	228 (26.4)	208 (56.1)	20 (4.1)	<0.001
	4–8	552 (64.0)	146 (39.3)	406 (82.5)	
	≧9	83 (9.6)	17 (4.6)	66 (13.4)	
Work shift (No, %)	Double shift	241 (27.9)	109 (29.4)	132 (26.8)	<0.001
	Triple shift	466 (54.0)	128 (34.5)	338 (68.7)	
	Duty system	144 (16.7)	128 (34.5)	16 (3.3)	
	Others	12 (1.4)	6 (1.6)	6 (1.2)	
Menstrual cycle (No, %)	Pre-menopause	338 (28.9)	132 (25.7)	206 (31.4)	0.111
	Peri-menopause	219 (18.8)	102 (19.8)	117 (17.9)	
	Post-menopause	531 (45.4)	248 (48.3)	283 (43.2)	
	Surgical menopause	81 (6.9)	32 (6.2)	49 (7.5)	
Marital status (No, %)	Married	840 (71.9)	355 (69.1)	485 (74.0)	0.007
	Single	179 (15.3)	101 (19.6)	78 (11.9)	
	Divorce	102 (8.7)	37 (7.2)	65 (9.9)	
	Others	44 (3.8)	20 (3.9)	24 (3.7)	
	Unknown	4 (0.3)	1 (0.2)	3 (0.5)	
Current smoking (No, %)	Yes	121 (10.3)	45 (8.7)	76 (11.6)	0.122
	No	1046 (89.5)	468 (91.1)	578 (88.2)	
	Unknown	2 (0.2)	1 (0.2)	1 (0.2)	
Alcohol habit (No, %)	Yes	357 (30.5)	172 (33.5)	185 (28.2)	0.055
	No	811 (69.4)	341 (66.3)	470 (71.8)	
	Unknown	1 (0.1)	1 (0.2)	0 (0.0)	

The values in parenthesis excluding age and BMI are percentage.
[a] Mean (SD).

no significant difference in these proportions between nurses in and not in managerial positions.

3.1. Menopausal symptoms in nurses

As shown in Fig. 1, the proportions of nurses who reported feeling tired or lacking in energy (94.8%), irritability (77.5%), difficulty in concentration (74.8%), feeling tense or nervous (70.7%) and feeling unhappy or depressed (69.1%) were high. The proportions of nurses with hot flashes and night sweats were relatively low (42% and 33%, respectively). Over half of the nurses reported some loss of interest in sex (55.2%). The median scores for psychological and somatic symptoms were significantly higher in the perimenopausal group, while scores for vasomotor and sexual symptoms were significantly higher in the postmenopausal group (Table 2).

3.2. Menopausal symptoms and managerial status

We divided the nurses into a low-score group (those recording "not at all" and "a little") and a high-score group ("quite a bit" and "extremely"). The total scores for menopausal symptoms and the scores on the clusters of menopausal symptoms (psychological, somatic, vasomotor and sexual factors) were not significantly different between nurses in managerial positions and those not in managerial positions (data not shown). However, the proportions of nurses reporting two individual menopausal symptoms, feeling unhappy or depressed and crying spells, were significantly higher among those in managerial positions (Table 3).

3.3. Job-related stress factors and managerial status

We divided the nurses into two groups: a low-score group (those recording "yes" and "yes to some extent") and a high-score group ("not really" and "no"). As shown in Table 4, among nurses in managerial positions, stresses related to quantitative overload were significantly greater than among nurses not in managerial positions. On the other hand, stresses related to physical overload, job control, skill discretion, workplace environment and job satisfaction in nurses not in managerial positions were significantly greater than in nurses in managerial positions. The total score for job-related stress among both types of nurses was significantly greater in the perimenopausal group. On individual items, scores for stresses related to quantitative overload, physical overload and job control were significantly higher in the perimenopausal group (Table 5).

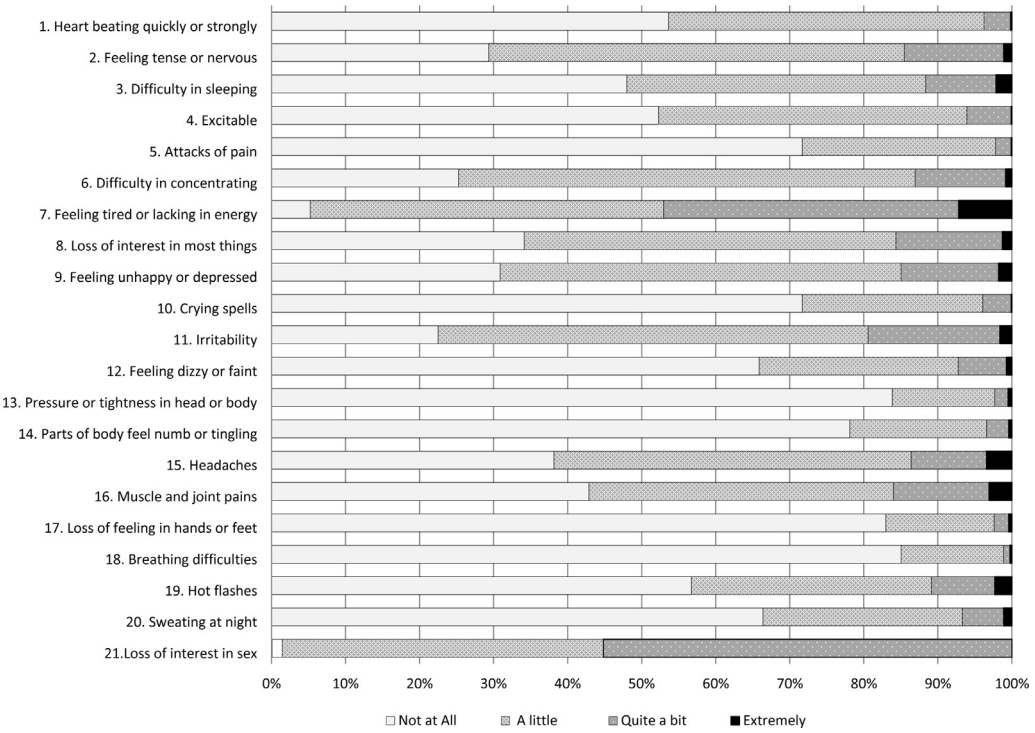

Fig. 1. Proportions of menopausal symptoms in nurses. Open bar: not at all, dotted bar: a little, oblique line bar: quite a bit, solid bar: extremely.

Table 2
Menopausal symptoms in nurses in pre-, peri- and postmenopause.

	Premenopause (n = 338)	Perimenopause (n = 219)	Postmenopause (n = 531)	p value
Psychological factor	7.0 (4.0, 11.0)	9.0 (6.0, 12.0)	8.0 (5.0, 11.0)	0.004
Anxietic factor	3.0 (1.0, 5.0)	4.0 (2.0, 5.0)	4.0 (2.0, 6.0)	0.001
Depressive factor	4.0 (3.0, 6.0)	5.0 (3.0, 7.0)	4.0 (3.0, 6.0)	0.001
Somatic factor	2.0 (1.0, 4.0)	3.0 (1.0, 4.0)	2.0 (1.0, 4.0)	0.008
Vasomotor factor	0.0 (0.0, 1.0)	1.0 (0.0, 2.0)	1.0 (0.0, 2.0)	<0.001
Sexual factor	1.0 (1.0, 2.0)	1.0 (1.0, 2.0)	2.0 (1.0, 2.0)	<0.001
Total	11.0 (7.0, 16.0)	14.0 (9.0, 20.0)	13.0 (9.0, 18.0)	<0.001

Median (25th percentile, 75th percentile).

Table 3
Menopausal symptoms in nurses with and those without managerial positions.

	Nurses with managerial position (n = 514)		Nurses without managerial position (n = 655)		p value
	Low score group	High score group	Low score group	High score group	
1. Heart beating quickly or strongly	495 (96.3)	19 (3.7)	630 (96.2)	25 (3.8)	1.000
2. Feeling tense or nervous	437 (85.0)	77 (15.0)	562 (85.8)	93 (14.2)	0.738
3. Difficulty in sleeping	458 (89.1)	56 (10.9)	575 (87.8)	80 (12.2)	0.521
4. Excitable	486 (94.6)	28 (5.4)	612 (93.4)	43 (6.6)	0.461
5. Attacks of pain	502 (97.7)	12 (2.3)	641 (97.9)	14 (2.1)	0.844
6. Difficulty in concentrating	441 (85.8)	73 (14.2)	575 (87.8)	80 (12.2)	0.337
7. Feeling tired or lacking in energy	267 (51.9)	247 (48.1)	352 (53.7)	303 (46.3)	0.555
8. Loss of interest in most things	431 (83.9)	83 (16.1)	555 (84.7)	100 (15.3)	0.686
9. Feeling unhappy or depressed	418 (81.3)	96 (18.7)	576 (87.9)	79 (12.1)	0.002
10. Crying spells	486 (94.6)	28 (5.4)	637 (97.3)	18 (2.7)	0.022
11. Irritability	419 (81.5)	95 (18.5)	523 (79.8)	132 (20.2)	0.503
12. Feeling dizzy or faint	480 (93.4)	34 (6.6)	620 (94.7)	35 (5.3)	0.383
13. Pressure or tightness in head or body	503 (97.9)	11 (2.1)	639 (97.6)	16 (2.4)	0.845
14. Parts of body feel numb or tingling	498 (96.9)	16 (3.1)	631 (96.3)	24 (3.7)	0.631
15. Headaches	448 (87.2)	66 (12.8)	562 (85.8)	93 (14.2)	0.548
16. Muscle and joint pains	429 (83.5)	85 (16.5)	553 (84.4)	102 (15.6)	0.688
17. Loss of feeling in hands or feet	505 (98.2)	9 (1.8)	636 (97.1)	19 (2.9)	0.249
18. Breathing difficulties	508 (98.8)	6 (1.2)	648 (98.9)	7 (1.1)	1.000
19. Hot flashes	455 (88.5)	59 (11.5)	587 (89.6)	68 (10.4)	0.571
20. Sweating at night	487 (94.7)	27 (5.3)	604 (92.2)	51 (7.8)	0.098
21. Loss of interest in sex	243 (47.3)	271 (52.7)	281 (42.9)	374 (57.1)	0.139

Number (%).
Low score group: not at all and a little; High score group: quite a bit and extremely.

Table 4
Job-related stress factors in nurses with and those without managerial positions.

	Job-related stress factors	Nurses with managerial positions ($n = 512$)		Nurses without managerial positions ($n = 653$)		p value
		Low score group	High score group	Low score group	High score group	χ^2
Quantitative overload	(1) You have to do an enormous amount of work	491 (95.9)	21 (4.1)	561 (85.9)	92 (14.1)	<0.001
	(2) You cannot complete all of your work in the allotted time	433 (84.6)	79 (15.4)	427 (65.4)	226 (34.6)	<0.001
	(3) You have to work very hard	489 (95.5)	23 (4.5)	593 (90.8)	60 (9.2)	0.002
Qualitative overload	(4) You have to focus your attention quite a lot	481 (93.9)	31 (6.1)	609 (93.3)	44 (6.7)	0.719
	(5) You do a difficult job that requires a high level of knowledge and skill	461 (90.0)	51 (10.0)	572 (87.6)	81 (12.4)	0.226
	(6) You have to constantly think about work during your working hours	483 (94.3)	29 (5.7)	585 (89.6)	68 (10.4)	0.004
Physical overload	(7) You do a lot of physical work	323 (63.1)	189 (36.9)	560 (85.8)	93 (14.2)	<0.001
Job control	(8) You can work at your own pace	343 (67.0)	169 (33.0)	463 (70.9)	190 (29.1)	0.160
	(9) You can decide the order in which you do your work and the way you do it	187 (36.5)	325 (63.5)	320 (49.0)	333 (51.0)	<0.001
	(10) You can express your own opinions on the workplace's work strategy	107 (20.9)	405 (79.1)	312 (47.8)	341 (52.2)	<0.001
Skill discretion	(11) You do not frequently use your skills and knowledge in the job	71 (13.9)	441 (86.1)	139 (21.3)	514 (78.7)	0.001
Interpersonal relationship	(12) There are differences of opinion within your department	226 (44.1)	286 (55.9)	275 (42.1)	378 (57.9)	0.512
	(13) Your department does not get on well with other departments	67 (13.1)	445 (86.9)	109 (16.7)	544 (83.3)	0.099
	(14) The atmosphere in your workplace is friendly	82 (16.0)	430 (84.0)	151 (23.1)	502 (76.9)	0.003
Workplace environment	(15) The environment of your workplace (noise, light, humidity and ventilation) is not so good	138 (27.0)	374 (73.0)	217 (33.2)	436 (66.8)	0.021
Job fitness	(16) The content of your work suits you	139 (27.1)	373 (72.9)	169 (25.9)	484 (74.1)	0.640
Job satisfaction	(17) You have job satisfaction in your work	72 (14.1)	440 (85.9)	122 (18.7)	531 (81.3)	0.039

Number (%).
Low score group: Yes and Yes to some extent; High score group: Not really and No.

Table 5
Job-related stress factors in nurses in pre-, peri- and postmenopausal stages.

	Job-related stress factors	Premenopause ($n = 338$)		Perimenopause ($n = 218$)		Postmenopause ($n = 528$)		p value
		Low score group	High score group	Low score group	High score group	Low score group	High score group	
Quantitative overload	(1) You have to do an enormous amount of work	306 (90.5)	32 (9.5)	209 (95.9)	9 (4.1)	464 (87.9)	64 (12.1)	0.004
	(2) You cannot complete all of your work in the allotted time	251 (74.3)	87 (25.7)	169 (77.5)	49 (22.5)	376 (71.2)	152 (28.8)	0.190
	(3) You have to work very hard	317 (93.8)	21 (6.2)	209 (95.9)	9 (4.1)	479 (90.7)	49 (9.3)	0.032
Qualitative overload	(4) You have to focus your attention quite a lot	319 (94.4)	19 (5.6)	210 (96.3)	8 (3.7)	484 (91.7)	44 (8.3)	0.046
	(5) You do a difficult job that requires a high level of knowledge and skill	315 (93.2)	23 (6.8)	200 (91.7)	18 (8.3)	445 (84.3)	83 (15.7)	<0.001
	(6) You have to constantly think about work during your working hours	308 (91.1)	30 (8.9)	200 (91.7)	18 (8.3)	481 (91.1)	47 (8.9)	0.957
Physical overload	(7) You do a lot of physical work	267 (79.0)	71 (21.0)	173 (79.4)	45 (20.6)	380 (72.0)	148 (28.0)	0.023
Job control	(8) You can work at your own pace	239 (70.7)	99 (29.3)	160 (73.4)	58 (26.6)	359 (68.0)	169 (32.9)	0.319
	(9) You can decide the order in which you do your work and the way you do it	151 (44.7)	187 (55.3)	107 (49.1)	111 (50.9)	212 (40.2)	316 (59.8)	0.069
	(10) You can express your own opinions on the workplace's work strategy	115 (34.0)	223 (66.0)	97 (44.5)	121 (55.5)	176 (33.3)	352 (66.7)	0.011
Skill discretion	(11) You do not frequently use your skills and knowledge in the job	51 (15.1)	287 (84.9)	36 (16.5)	182 (83.5)	104 (19.7)	424 (80.3)	0.197
Interpersonal relationship	(12) There are differences of opinion within your department	134 (39.6)	204 (60.4)	103 (47.2)	115 (52.8)	228 (43.2)	300 (56.8)	0.206
	(13) Your department does not get on well with other departments	54 (16.0)	284 (84.0)	32 (14.7)	186 (85.3)	79 (15.0)	449 (85.0)	0.893
	(14) The atmosphere in your workplace is friendly	62 (18.3)	276 (81.7)	48 (22.0)	170 (78.0)	108 (20.5)	420 (79.5)	0.552
Workplace environment	(15) The environment of your workplace (noise, light, humidity and ventilation) is not so good	111 (32.8)	227 (67.2)	73 (33.5)	145 (66.5)	145 (27.5)	383 (72.5)	0.129
Job fitness	(16) The content of your work suits you	87 (25.7)	251 (74.3)	66 (30.3)	152 (69.7)	133 (25.2)	395 (74.8)	0.340
Job satisfaction	(17) You have job satisfaction in your work	58 (17.2)	280 (82.8)	42 (19.3)	176 (80.7)	78 (14.8)	450 (85.2)	0.292

Number (%).
Low score group: Yes and Yes to some extent; High score group: Not really and No.

3.4. Associations between background characteristics and menopausal symptoms

Nurses with a high BMI tended to have a high score for vasomotor symptoms ($r = 0.132$, $p < 0.01$) (data not shown). Cigarette smoking, alcohol consumption, and frequency of working night shifts were not associated with menopausal symptoms. Managerial position did not greatly influence these results.

3.5. Associations between psychological stress and menopausal symptoms

As shown in Table 6, high levels of job-related stress were significantly associated with high scores on Greene's Climacteric Scale, particularly for psychological symptoms. Having fewer job-related interpersonal relationships was significantly correlated with menopausal symptoms. Among the nurses in managerial positions, low levels of job fitness and satisfaction were correlated with psychological symptoms. The associations between job-related stress and vasomotor symptoms and somatic symptoms were weak. In the perimenopausal group, less job control and less job fitness were correlated with menopausal symptoms, particularly psychological symptoms (Table 7).

4. Discussion

In the present study, we found high prevalence rates of general fatigue, irritability and loss of concentration as menopausal symptoms among Japanese nurses. Liu et al. similarly reported that severe menopausal symptoms in middle-aged nurses in China were fatigue and irritability [16]. Dhillon et al. reported that the prevalence of fatigue in nurses and teachers was 79.1% [20]. On the other hand, in a community-based study in Japan, Ishizuka et al. found that the prevalence of fatigue was 64.7%, which was higher than that of hot flashes, but that the prevalence of irritability was 38.8%, which was relatively low [21]. These findings suggest that the working environment plays a role in both fatigue and irritability. Since nurses are consistently busy and have to deal with various kinds of patients, they are more likely to experience irritability [16].

We also found that 55% of Japanese middle-aged nurses did not have much interest in sex. Mita et al. also reported that a high proportion of middle-aged women in Japan who have a male partner have a low level of sexual interest [22].

The proportions of nurses with hot flashes (42%) and night sweats (33%) in our study were higher than those reported previously [23,24]. It was recently reported that the prevalence of hot flashes was 36.9% among 50-year-old Japanese women [21] and 46.6% among 40–60-year-old Japanese women [25]. Our data are similar. There has been an increase in the prevalence of hot flashes among Japanese women, which may be due to a more western lifestyle and diet, and an increase in awareness of menopausal symptoms as treatable conditions. It has been reported that 30.8% of nurses in China have hot flashes; this was similarly accompanied by the suggestion that nurses are likely to be more aware of menopausal symptoms than the general population and therefore more likely to recognize them in themselves [16]. We confirmed that a high BMI is associated with vasomotor symptoms, as reported previously [21,26]. Having to do shift work, the frequency of night shifts, current smoking and alcohol intake were not associated with menopausal symptoms.

In the present study, nurses in managerial positions more often reported feelings of unhappiness or depression and crying spells than other nurses. They may have been under high degrees of psychological stress, for example having to deal with medical incidents and accidents. In addition, the provision of high-quality nursing care is an important part of the work of nurses in managerial positions and they are likely to have responsibility for the effective use of nurses (i.e. managing human resources), as well as their training [27].

We found that the job-related stress factors differed between those nurses in managerial positions and those not. The former reported quantitative overload. On the other hand, nurses not in managerial positions were more likely to report job control, skill discretion and workplace environment as stress factors. Feeling stress from physical overload may be due to an increase in somatic activity. It has been reported that women not in managerial positions have more symptoms and poorer job performance than women in managerial positions [28]. Problems with the workplace environment, such as temperature and poor ventilation, have been thought to worsen menopausal symptoms.

While both groups of nurses reported relatively high levels of job satisfaction, it was lower among those not in managerial positions. Boyle et al. found that leadership among nurses in managerial positions was associated with job satisfaction; among nurses not in managerial positions it was associated with job continuation [29].

Menstrual status, as well as menopausal symptoms, was a factor influencing the prevalence of job-related stress. We found that nurses both in and not in managerial positions reported more menopausal symptoms and job-related stress in the perimenopausal stage. Anderson et al. found that menopausal symptoms increased from the pre- to the perimenopausal phases [25]. In a longitudinal study, Mishra et al. found that severe psychological symptoms peaked at menopause or in the year after and that severe vasomotor symptoms increased rapidly in perimenopause and remained high for four years or more after menopause [24]. The responsibility of nurses (including guidance for younger nurses) tends to increase with length of service and therefore age. Nurses in managerial positions have roles not only as care providers, but also as organizational and human resource managers, risk managers and educators [30]. They are also busy on committees related to these roles. Since the average age of the nurses in managerial positions was close to the average age at menopausal transition, greater participation in various committees is expected around the menopausal transition.

It has been found that women who report experiencing job-related stress are likely to have earlier menopause [31]. Perimenopause may be the period in which nurses are likely to feel the greatest stress, and stressful working conditions may be associated with worse menopausal symptoms.

It has been reported that fatigue is associated with psychological and lifestyle factors but not with occupational status and that women who work part time or not at all are more likely to experience sensitivity to cold than are women who work full time [21]. In the present study, psychological symptoms were associated with poor interpersonal relationships as a job-related stress factor, by nurses both in and not in managerial positions. Nurses may be worried about relationships with other nurses as well as with patients. Nurses do not work in isolation and their relationships with medical staff and other colleagues are important features of the work environment. In addition, we showed that psychological symptoms were related to less job fitness and satisfaction in nurses in managerial positions. Nurses in managerial positions might feel more psychological stress than other nurses. Kawano et al. reported that lower job fitness caused lack of vigor, irritability, fatigue and depression in Japanese nurses working in an acute care hospital [13]. Less job fitness and satisfaction, and feelings of powerlessness in particular, may be associated with psychological symptoms.

It is necessary to explore both the ways in which work might affect menopausal symptoms and the ways in which menopausal symptoms might affect working life. Griffiths et al. reported that poor concentration, tiredness and poor memory were the most

Table 6
Correlation of job-related stress factors with menopausal symptoms.

Job-related stress factors	Menopausal symptoms (total)			Psychological symptoms		
	All nurses	Nurses with managerial positions	Nurses without managerial positions	All nurses	Nurses with managerial positions	Nurses without managerial positions
Quantitative overload	−0.140**	−0.106*	−0.172**	−0.148**	−0.103*	−0.187**
Qualitative overload	−0.109**	−0.130**	−0.094*	−0.125**	−0.160**	−0.098*
Physical overload	−0.072*	−0.036	−0.103**	−0.086**	−0.067	−0.100*
Job control	−0.184**	−0.167**	−0.192**	−0.187**	−0.171**	−0.197**
Skill discretion	−0.117**	−0.181**	−0.068	−0.118**	−0.189**	−0.063
Interpersonal relationships	−0.227**	−0.230**	−0.224**	−0.223**	−0.226**	−0.222**
Workplace environment	−0.153**	−0.169**	−0.139**	−0.146**	−0.170**	−0.124**
Job fitness	−0.194**	−0.245**	−0.155**	−0.206**	−0.264**	−0.160**
Job satisfaction	−0.186**	−0.210**	−0.169**	−0.201**	−0.260**	−0.155**
Total	−0.291**	−0.304**	−0.282**	−0.306**	−0.331**	−0.287**

* $p < 0.05$.
** $p < 0.01$.

Table 7
Correlation of job-related stress with menopausal symptoms in pre-, peri- and postmenopausal stages.

Job-related stress factors	Menopausal symptoms (total)			Psychological symptoms		
	Premenopause ($n = 338$)	Perimenopause ($n = 219$)	Postmenopause ($n = 531$)	Premenopause ($n = 338$)	Perimenopause ($n = 219$)	Postmenopause ($n = 531$)
Quantitative overload	−0.078	−0.163*	−0.180**	−0.104	−0.152*	−0.181**
Qualitative overload	−0.033	−0.107	−0.192**	−0.039	−0.121	−0.212**
Physical overload	0.015	−0.141*	−0.102*	0.014	−0.173*	−0.117**
Job control	−0.165**	−0.385**	−0.129**	−0.185**	−0.406**	−0.123**
Skill discretion	−0.153**	−0.064	−0.108*	−0.151**	−0.056	−0.114**
Interpersonal relationships	−0.203**	−0.165*	−0.267**	−0.203**	−0.175**	−0.253**
Workplace environment	−0.203**	−0.196**	−0.126**	−0.197**	−0.180**	−0.113**
Job fitness	−0.187**	−0.267**	−0.149**	−0.217**	−0.301**	−0.142**
Job satisfaction	−0.219**	−0.224**	−0.140**	−0.240**	−0.254**	−0.139**
Total	−0.239**	−0.344**	−0.322**	−0.260**	−0.372**	−0.325**

* $p < 0.05$.
** $p < 0.01$.

problematic symptoms for work [2]. Geukes et al. reported that psychological and somatic scores on Greene's Climacteric Scale were negatively associated with work ability [4]. Hammam et al. reported that the main symptoms affecting work capacity and performance were tiredness and changes in sleep pattern [1]. On the other hand, poor physical environment, such as workplace temperature, ventilation and noise, and overload have been reported to be the main factors that aggravated menopausal symptoms [1]. We found that there was an association between psychological symptoms and job-related stress in the perimenopausal group.

There are, thus, complex interrelationships between work and menopause. Minimizing job-related stress factors might reduce menopausal symptoms, and would be important step in optimizing the physical and mental health of nurses.

There are several limitations in the study. First, it was cross-sectional. The causal relationships between menopausal symptoms and job-related stress factors should be clarified by a longitudinal study. Second, it has been reported that educational background influences the prevalence of hot flashes and depression [21]. We recruited registered nurses, whose level of education would have been very similar. Third, the association between menopausal symptoms and job-related stress may differ across hospital departments, but this was not tested. It has been reported that working in particular departments affects the mental health of nurses independently of demographic and job-related stress factors [13]. Another limitation is that the study relied on self-report, particularly of symptoms, BMI and menstrual status. The use of standard questions for these items would enhance the comparability of these results with those from other studies. Finally, we recruited only Japanese women, since differences in culture may influence menopausal symptoms. Therefore, our findings cannot be generalized to women of other races.

5. Conclusion

Health care practitioners should be aware that menopausal symptoms are associated with job-related stress during the menopausal transition. Information on the differences in these associations between nurses in managerial positions and other nurses is important as it will allow their health care to be managed on a more individual basis.

Contributors

Kazuyo Matsuzaki and Toshiyuki Yasui contributed to the design of the study, collected the data and commented on the first draft of the paper. Kazuyo Matsuzaki and Hirokazu Uemura analyzed the data. All authors reviewed the final version of the manuscript.

Competing interest

The authors declare that there is no conflict of interest for this work.

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Ethical approval

The Ethics Committee of Tokushima University Hospital approved the study (number 1772).

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