

Correlations between Mood/Anxiety Disorders and Working Environment, Occupational Stress, Health-related QOL, and Fatigue among Working Women

Michiko Nohara¹⁾, Hitomi Tatsuta²⁾, Naomi Kitano³⁾, Hiromi Hoshino⁴⁾, Toshiko Kamo¹⁾, Tetsuo Tai⁵⁾,
Tetsuya Tamaki²⁾ and Hishio Nanjo²⁾

¹⁾Tokyo Women's Medical University

²⁾Japan Labour Health and Welfare Organization, Wakayama Rosai Hospital

³⁾Department of Public Health, Wakayama Medical University

⁴⁾Japan Labour Health and Welfare Organization, Kanto Rosai Hospital

⁵⁾National Institute of Occupational Safety and Health

(Received: April 30, 2013)

Abstract

Objectives: In order to verify factors related to mood/anxiety disorders among working women, a questionnaire and physiological examination were conducted. Incidence of a mood/anxiety disorders, occupational stress, health-related QOL, and fatigue were assessed.

Subjects: Subjects were 101 female clerical staff from two companies, which were available upon request by the authors. Subjects provided consent to the written and oral explanation of the study objectives and methods. The survey period was from December 2010 to February 2011.

Methods: A survey (including an assessment of working environment, mood/anxiety disorders; Japanese version of the K6 questionnaire, health-related QOL scale; Japanese version of the SF-8, occupational stress; and the Japanese version of the effort-reward imbalance model questionnaire) and an accelerated plethysmography assessment were conducted. Artett (U-Medica, Inc) was used for the measurement of accelerated plethysmography; this evaluation was conducted in a resting-sitting position for 3 minutes.

Results: Mean age of the subjects was 38.3 ± 9.4 years. Mean K6 value was 5.2 ± 4.7 . In total, 19 subjects (19%) had K6 values greater than 9, suggesting the presence of a mood/anxiety disorder. Subjects were grouped into those with a K6 score less than 9 (non-mood/anxiety disorder group) and those with a K6 score greater than 9 (mood/anxiety disorder group). Results of a correlation analysis demonstrated significant correlations between the presence/absence of a mood/anxiety disorder and an effort/reward (E/R) ratio, overall health from the SF-8, daily functioning (physical), vitality, social functioning, mental health, daily functioning (psychological), and mental summary score. Furthermore, multivariate analysis of the significant factors revealed a significant prediction of mood/anxiety disorder through the mental summary score of the SF-8.

Conclusion: 20% of working women had a mood/anxiety disorder problem. It is important to verify contributing factors to these mental health problems in order to alleviate such issues in the future.

(JJOMT, 61: 360—366, 2013)

—Key words—

working women, K6, effort-reward imbalance model, SF-8, accelerated plethysmography

I. Background and Objectives

Implementation of the Gender Equality in Employment Act in 1985, and a subsequent revised version of this law, led to great changes with regard to occupational environments for working women in Japan.¹⁾ Given the presently strict working environments in Japan, higher rates of stress and increased mental health problems have emerged among workers. Based on the 2007 Workers' Health Study,²⁾ 58% of individuals suffered from stress in the workplace. Furthermore, based on an actual evaluation of company mental health measures, which was carried out by the Institute of Labour Administration (private investigation agency) in 2010,³⁾ 44% of individuals reported poor mental health status within the last 3 years. In addition, the "study of model systems within female outpatient clinics" reported that approximately 60% of the clinic visits were due to work-related stress. This group also tended to show high levels of stress.⁴⁾

Regarding these issues, the government has paid special attention to workers' mental health. A screening tool for rapid recognition of depression among workers has been developed,⁵⁾ which included the development of the K10/6⁶⁾ as an evaluation tool for depression and anxiety disorders. The screening efficacy (sensitivity and specificity) of the K10/6 has been shown to be adequate. A comparative study of the K10/6's screening efficacy⁷⁾ also produced positive results.⁸⁾

Recently, an objective measurement method has been developed for evaluating fatigue associated with mood and anxiety disorder-related factors, including depression. An evaluation of autonomic nervous functioning was also carried out using a frequency analysis (i.e., a high-speed Fourier conversion of the coefficient of variation and R-R long-term time-series data) obtained from an earlier R-R interval within an electrocardiogram.⁹⁾ In 1997, Takada et al. used a simple digital pulse volume and successfully developed a method for evaluating autonomic nervous system functioning.¹⁰⁾

Given the various tools that have been developed for evaluating mental health status and its correlated factors, we carried out a survey for verifying potential precursors to mood/anxiety disorders among working women using a reliable and valid questionnaire, as well as an objective physiological measure.

II. Methods

Subjects:

Subjects were invited to participate in the study through e-mail, and 101 working women from two companies volunteered. All of 101 subjects were clerical staff. Written consent to the explanations of the objectives and methods of the current study was obtained from each. The survey period was from December 2010 to February 2011.

Methods:

A survey (working environment, K-6, health-related QOL scale of the SF-8,¹¹⁾ and the effort-reward imbalance model¹²⁾ and accelerated plethysmography measurement¹³⁾ were conducted.

The K-6 is a simple mental health scale consisting of 6 items adapted from 18 existing mental health items from the full scale. This allows for an evaluation of mood/anxiety disorder severity. Frequency of symptoms was evaluated on a 5-point scale (0–4 points), in which higher scores indicate a higher level of depression/anxiety. Kawamura et al. proposed a 3-level K6 total point classification (more than 5 points is equivalent to psychological stress, more than 10 points is equivalent to a mood/anxiety disorder, more than 13 points is equivalent to a severe mental disorder).¹⁴⁾ However, in order to compare the result data, the analysis for the study was carried out based on a report of occupational survey among subjects similar to present study by Suzuki et al., in which a score of 9 or above was the cut off for determining a diagnosable mood/anxiety disorder.

The health-related QOL scale (SF-8)¹¹⁾ is an 8-item measure focusing on QOL (overall health, body functioning, daily functioning-physical, body pain, vitality, social life functioning, mental health, daily functioning-psychological) scored on a scale from 1–5 points (1–6 points for overall health and body pain). This allows for the evaluation of physical and mental health status. Furthermore, a national standardized QOL value has been established (standard value = 50 points, standard deviation = 10 points). Health status can be evaluated by referring to this standard value. Higher scores indicate higher QOL.¹⁵⁾

The effort-reward imbalance model questionnaire¹²⁾ is an occupational stress measure, which was adapted from the effort-reward imbalance model proposed by German sociologist, Siegrist, in 1996.¹⁴⁾ It is a scale for evaluating situation-specific factors (external efforts, external reward) and personal factors (over commitment). External effort is a 6-item evaluation of work demand, responsibility, and burden, whereas external reward is an 11-item evaluation of economical, psychological, and career reward. In this model, high effort/low reward is seen as a stressful condition. The effort and reward items were evaluated using a 5-point scale (1–5) for the presence or absence of a stressful condition and whether this condition concerns the individual. The ratio of effort and reward, which was multiplied by item number-adjusted coefficients, can be an indicator of effort-reward imbalance status (E/R ratio). E/R ratio of 1.0 was set as a threshold, and the respondents were categorized as part of a high-risk group (>1.0) or a no-risk group (≤ 1.0).

The accelerated plethysmography is the second derivative of the digital pulse volume waveform. The a-a interval of the accelerated plethysmography is believed to be physiologically similar to the R-R interval of the electrocardiogram.¹⁵⁾ Based on an analysis of the R-R interval of the electrocardiogram, LF of up to 0.15 Hz is known to reflect sympathetic nervous system activity, whereas HF greater than 0.15 Hz reflects parasympathetic nervous system activity.⁹⁾ LF/HF indicates autonomic nervous system functioning. If the LF/HF value is high, it becomes sympathetic dominant, indicating a state of fatigue. Artett (U-Medica, Inc) was used to record the accelerated plethysmography; evaluation was done in a resting-sitting position for 3 minutes.

Analyses were performed with the SAS system ver. 9.3 software (SAS Institute, Cary, NC, USA). Data are presented as mean $\pm$ SD. Both univariate and multivariate logistic regression model with stepwise variables selection method was used. The significance level of stepwise effect selection into the model was 0.10. The influence of profile, interaction, and multicollinearity in the model were examined using regression diagnostic analysis. C-statistic was also used for logistic model fitting. Two-tailed P values of less than 0.05.

This study was approved by the Ethics Committee of Japan Labour Health and Welfare Organization.

III. Results

After excluding 1 subject due to inadequate answers on the survey, 100 subjects remained for full analyses. Mean age of the subjects was 38.3 ± 9.4 years, and the mean K6 value was 5.2 ± 4.7 . There were 19 subjects with a suspected mood/anxiety disorder (K6 of more than 9 points), whereas 81 subjects scored below a 9 on the K6. The characteristics of the subjects based on their K6 value are presented in Table 1. All subjects (working women) worked normal day shifts. Hazardous work and work posture were not observed.

Next, mood and anxiety disorder-related factors divided by K6 values are shown in Table 2. We observed strong correlations with the E/R ratio, overall health from the SF-8, daily functioning (physical), vitality, social functioning, mental health, daily functioning (psychological), and mental summary score.

Lastly, results of a multivariate analysis on mood/anxiety disorders and related factors are shown in Table 3. There was no significant correlation between age and accelerated plethysmography, but there was a strong correlation between the effort-reward imbalance model and mental summary score from the SF-8.

IV. Discussion

Mental health care in the workplace has become an important task. Several mental health-related studies have rapidly increased in recent years; however, only a few studies have focused on the mental health of working women. Furthermore, most studies in this area have assessed female nurses, whereas studies involving women working within other professions are limited.¹⁶⁾ Since we assessed female clerical staff utilizing a well-verified questionnaire and physiological method, the results of our current study could be very valuable.

The mean K6 value of 5.2 ± 4.7 in the present survey is considered rather high. Given that 19% of our sample had a K6 value greater than 9 points (indicating the presence of a mood/anxiety disorder), we observed that a sizable number of working women were dealing with a poor mental health status and required mental care. Our results are similar to those of Tsuno et al.,¹⁷⁾ which included a sample of Japanese workers with a mean K6 value for working women (mean age was 36.0 ± 8.9 years) of 5.6 ± 4.6 . Thus, results of the present study are in keeping with previous research. In contrast, Kawakami et al.⁸⁾ observed a K6 mean value for work-

Table 1 Characteristics of the subject by K6 score

Variables	Total (N = 100)	K6 < 9 (N = 81)	K6 ≥ 9 (N = 19)	
Age				
Mean Value	38.3 ± 9.4	38.7 ± 9.8	36.5 ± 7.5	0.349 [N.S]
Range	(19–61)	(19–61)	(24–51)	
Number of Employees at the Workplace				
49 or less	34	30	4	0.622 [N.S]
50–99 persons	4	3	1	
100–299 persons	16	11	5	
300–499 persons	17	13	4	
500–999 persons	6	6	0	
1000 and over	21	17	4	
Percentage of Female Employees at the Workplace				
less than 10%	37	31	6	0.782 [N.S]
10%–less than 30%	7	7	3	
30%–less than 50%	4	4	2	
50% and over	51	51	8	
Working Hours				
less than 6 hours	4	4	0	0.281 [N.S]
6–less than 7 hours	8	7	1	
7–less than 8 hours	15	13	2	
8–less than 9 hours	32	25	7	
9–less than 10 hours	21	16	5	
10–less than 12 hours	17	15	2	
12 hours and over	3	1	2	
Type of Employment				
Full-time Employee	62	51	11	0.463 [N.S]
Part-time Worker	19	17	2	
Dispatched Employee	8	5	3	
Others	11	8	3	
Type of Occupation				
Sales	5	5	0	0.633 [N.S]
Clerical Work	59	45	14	
Service	4	4	0	
Specialized/Technical	25	21	4	
Transportation/Communication	0	0	0	
Accounting/Labor Affairs	0	0	0	
Administration	1	1	0	
Others	6	5	1	
Tasks in a standing position	21	20	1	
Tasks in a half-crouching position	2	0	2	
Tasks in a bent-over position	6	3	3	
Tasks in a seated position	58	47	11	
Tasks that require long hours of walking	4	4	0	
Tasks that require long hours of driving	0	0	0	
Tasks that require workers to alternate sitting and standing	9	6	3	
Others	1	0	1	

ing women of 2.6 ± 3.6 , which was extremely low compared to our present results. Because our subjects were all full-time employees with a mean age of 38.3 ± 9.4 years, which is considered young when compared to Kawakami et al.'s sample (50.7 ± 16.5 years), it could be speculated that mental health status in our present survey was lower. However, the percentage of those with a K6 greater than 9 points was higher compared to results from another study that included local government public officers (15.8%).¹⁵⁾ Mean age of those government employees was 41.1 ± 12.5 , which was similar to the average age of our sample, suggesting that differences in reported mood/anxiety disorders might be due to differences in working conditions for working

Table 2 The situation of occupational stress, QOL and fatigue by K6 score

Variables	Total (N = 100)	K6 < 9 (N = 81)	K6 ≥ 9 (N = 19)	
LF/HF				
Mean Value	1.70 ± 2.06	1.76 ± 2.24	1.43 ± 0.93	0.536 [N.S]
Range	(0.19–15.71)	(0.19–15.71)	(0.20–3.68)	
E/R Ratio				
Mean Value	0.5 ± 0.3	0.5 ± 0.2	0.8 ± 0.4	< .001 [* * * * *]
Range	(0–2)	(0–1)	(0–2)	
≤	94	79	15	0.002 [* * *]
>1	6	2	4	
SF-8				
General Sense of Well-being	46.64 ± 6.82	47.52 ± 6.44	42.89 ± 7.27	0.007 [* * *]
Physical Functioning	50.59 ± 4.20	47.52 ± 6.44	50.08 ± 5.04	0.563 [N.S]
Role Functioning-Physical	49.81 ± 5.33	50.37 ± 4.62	47.42 ± 7.32	0.029 [*]
Bodily Pain	49.18 ± 7.69	49.62 ± 7.55	47.26 ± 8.18	0.230 [N.S]
Vitality	47.81 ± 6.23	48.88 ± 5.77	43.23 ± 6.20	< .001 [* * * * *]
Social Functioning	48.58 ± 8.08	49.97 ± 6.88	42.64 ± 10.11	< .001 [* * * * *]
Mental Health	46.03 ± 7.34	47.96 ± 5.88	37.80 ± 7.36	< .001 [* * * * *]
Role Functioning-Emotional	48.09 ± 5.99	49.12 ± 4.95	43.70 ± 7.94	< .001 [* * * * *]
Physical Component Summary Score	49.29 ± 5.31	49.22 ± 4.83	49.55 ± 7.16	0.809 [N.S]
Mental Component Summary Score	45.58 ± 7.92	47.48 ± 6.07	37.44 ± 9.75	< .001 [* * * * *]

Table 3 Relations between Mood/Anxiety Disorder and Working environment, Occupational stress, QOL, Fatigue by Logistic Regression Analysis.

	Univariable Crude			Multivariable Adjusted		
	Odds Ratio	(95% CI)	P-Value	Odds Ratio	(95% CI)	P-Value
Age	0.97	(0.92–1.03)	0.346			
LF/HF	0.90	(0.66–1.25)	0.537			
Log (E/R) (per 0.1)	1.67	(1.23–2.27)	0.001			
Physical Component Summary Score	1.01	(0.92–1.11)	0.807			
Mental Component Summary Score	0.84	(0.77–0.91)	< .001	0.84	(0.77–0.91)	< .001

CI denotes confidence interval.

women within government and general occupational fields. In addition, because there is more gender equality and maternity protection within public offices compared to general occupations, implementation rate of mental health care is also high for those working for the government, which might also account for the differences from our results.

Furthermore, in terms of the mean SF-8 values from the current survey, overall health, vitality, mental health, and mental summary scores were low compared to standard values of the Japanese female population.¹¹⁾ These results also demonstrate that compared to general workers, working women in this survey had a relatively low mental health status.

In the univariate analysis of mood and anxiety disorder-related factors, strong correlations were found with the E/R ratio, overall health from the SF-8, daily functioning (physical), vitality, social life functioning, mental health, daily functioning (psychological), and mental summary score. In the multivariate analysis, the K6 had no correlation with age and accelerated plethysmography, but had strong correlation with the effort reward imbalance model and mental summary score from the SF-8. In the study assessing local government public officers,¹⁵⁾ a strong correlation between the K6 and effort-reward imbalance was observed, suggesting that stress due to effort-reward imbalance in the workplace was associated with mood/anxiety disorders. Furthermore, a study on employees from private companies also observed a strong correlation between the K6 and mental summary score from the SF-8⁵⁾ and an association with mood/anxiety disorders. In addition, there

was no correlation between accelerated plethysmography and K6 value, suggesting no apparent association between state of fatigue and mood/anxiety disorders among working women.

The present study is not without a limitation. We only assessed working women from two workplaces in the present study, the results cannot be generalized to all Japanese working women. Nevertheless, considering the lack of research examining general working women, results from the present study were valuable. The high incidence of mood/anxiety disorders observed in this study suggests a need to conduct a similar survey within several workplaces and evaluate the occurrence of mood/anxiety disorders among Japanese working women, as well as its correlated factors, in the future.

V. Conclusion

Nearly 20% of working women were suspected of having a mood/anxiety disorder. We observed that work-related stress and QOL were significantly correlated. It is important to conduct a similar survey in other workplace domains to verify the incidence of mood/anxiety disorders among Japanese working women and help curb the manifestation of these disorders in the future.

Acknowledgement

This study is part of a survey study assessing the correlation between stress among working women and disease onset and progression for the medical care of working women within a worker agency/welfare organization.

Competing Interests

The authors declare that they have no competing interests.

References

- 1) Nohara M, Kitagawa T, Shigetomi A, Kagawa J: Problems of working women: Past research and future issues. *Occup Health Rev* 14 (2): 119—129, 2001.
- 2) Ministry of Health, Labour and Welfare: Workers Health Survey 2007. Ministry of Health, Labour and Welfare. 2008.
- 3) Institute of Labour Administration: Actual survey on countermeasures of company mental health. Institute of Labour Administration. 2010.
- 4) Japan Labour Health and Welfare Organization: Research, development and distribution of correlation between womens' diseases and presence or absence of work and content of work. Research Report. 2008.
- 5) Makita K, Takada S, Hitokoto H, et al: Analysis of a screening tool for rapid diagnosis of depression in workers: from the point of view of the QOL and Presenteeism. *Jpn Bull Trauma Stress Stud* 7: 33—40, 2011.
- 6) Furukawa TA, Kawakami N, Saitoh M, et al: The performance of the Japanese version of the K6 and K10 in the World Mental Health Survey Japan. *Int J Methods Psychiatr Res* 17 (3): 152—158, 2008.
- 7) Kawakami N: National survey on the distribution of mental health disorders using the K6 survey and its correlated factors. 2006 Health science research, grants-in-aid for advanced usage statistics research project. Research on analysis system of statistics of public health situation from family unit. Research Report. 2006, pp 13—21.
- 8) Kawakami N, Kondo K, Yanagida K: Mental health research on suicide-prevention measures in adults. 2004 Health and labor science research, grants-in-aid for scientific research of health care business. Research on the implementation of prevention based on actual suicide. Research Report. 2004, pp 147—170.
- 9) Akselrod S, Gordon D, Madwed JB, et al: Hemodynamic regulation: Investigation by spectral analysis. *Am J Physiol* 249: H867—H875, 1985.
- 10) Takada M, Ebara T, Sakai Y: The acceleration plethysmography system as a new physiological technology for evaluating autonomic modulations. *J Human Ergol* 35: 1—5, 2008.
- 11) Japanese version of the SF-8 manual (national standard value, published version 2007). Nonprofit health medical evaluation and research institute.
- 12) Tsutsumi A: Effort-reward imbalance model occupational stress questionnaire, user manual, Japanese version (2007.4).
- 13) Takada M, Ebara T, Sakai Y, Kuwano Y: Stationarity of heart rate variability by acceleration plethysmography: Short-term measurements of healthy young adults in daily life. *J Human Ergol* 38: 41—50, 2009.
- 14) Siegrist J, Starke D, Chandola T, et al: The Measurement of Effort-Reward Imbalance at Work: European Comparisons. *Soc Sci Med* 58 (8): 1483—1499, 2004.
- 15) Suzuki K, Sasaki H, Motohashi Y: Relationships among mood/anxiety disorder, occupational stress and life situation: Results

of a survey of a local government staff. Health Sci Bull Akita Univ 18 (2): 50—59, 2010.

- 16) Koyama M, Satou T, Kido T, et al: Research on a survey study of working women-related health problems in the industry. 2005 Industrial Health Survey Research Report. 2006, pp 32—35.
- 17) Tsuno K, Kawakami N, Inoue A, et al: Intragroup and intergroup conflict at work, psychological distress, and work engagement in a sample of employees in Japan. Ind Health 47: 640—648, 2009.

Reprint request:

Michiko Nohara
Department of Hygiene and Public Health, Tokyo Women's
Medical University School of Medicine, 8-1, Kawada-cho,
Shinjuku-ku, Tokyo, 162-8666, Japan.

別刷請求先 〒162-8666 東京都新宿区河田町 8—1
東京女子医科大学
野原 理子

就労女性の気分・不安障害と就労環境，職業性ストレス， 健康関連 QOL および疲労度の関連

野原 理子¹⁾，辰田 仁美²⁾，北野 尚美³⁾，星野 寛美⁴⁾
加茂登志子¹⁾，田井 鉄男⁵⁾，玉置 哲也²⁾，南條輝志男²⁾

¹⁾東京女子医科大学

²⁾独立行政法人労働者健康福祉機構和歌山労災病院

³⁾和歌山県立医科大学公衆衛生学教室

⁴⁾独立行政法人労働者健康福祉機構関東労災病院

⁵⁾独立行政法人労働安全衛生総合研究所

—キーワード—

就労女性，K6，努力報酬不均衡モデル，SF-8，加速度脈波

目的：就労女性の気分・不安障害の実態と関連する要因を検証するために，質問紙と生理学的検査を用いて，気分・不安障害，職業性ストレス，健康関連 QOL，疲労度を調査した。

対象：著者らが調査を依頼可能であった 2 事業所において書面及び口頭で研究の趣旨および方法について説明し，賛同いただいた両事業所の全就労女性 101 名を対象とした。調査期間は 2010 年 12 月から 2011 年 2 月までであった。

方法：質問紙（就労環境，気分・不安障害；K-6 質問票日本語版，健康関連 QOL 尺度；SF-8 日本語版，職業性ストレス；日本語版努力報酬不均衡モデル調査票）による調査と加速度脈波測定を行った。加速度脈波は，（株）ユメディカ製アルテットを用い，安静座位で 3 分間測定した。

結果：対象者の平均年齢は 38.3 ± 9.4 歳であった。K6 の平均値は 5.2 ± 4.7 で，K6 得点 9 点以上で気分・不安障害が疑われたものの割合は 19 名（19%）であった。K6 の得点により気分・不安障害なし群（9 点未満）と気分・不安障害疑い群（9 点以上）に分け，各因子との関連を検討したところ，E/R 比，SF-8 のうち全体的健康感，日常役割機能（身体），活力，社会生活機能，心の健康，日常役割機能（精神）および精神的サマリースコアとの関連が示された。さらに関連が示された因子の多変量解析では，SF-8 の精神的サマリースコアとの関連が見られた。

結語：就労女性の 2 割が気分・不安障害に問題があった。今後その要因を明らかにし，改善する必要が示唆された。
（日職災医誌，61：360—366，2013）