

**Correlations among insomnia, psychological distress,  
and quality of life in a population of ambulatory women  
undergoing breast cancer screening, biopsy, and diagnosis**

Chika MINOWA · Mariko FUTAGAMI · Kaori MIYAHARA · Kayo YANAGISAWA

高崎健康福祉大学紀要 第18号 別刷

2019年3月

# Correlations among insomnia, psychological distress, and quality of life in a population of ambulatory women undergoing breast cancer screening, biopsy, and diagnosis

Chika MINOWA · Mariko FUTAGAMI<sup>1)</sup> · Kaori MIYAHARA<sup>1)</sup> · Kayo YANAGISAWA<sup>1)</sup>

(Received Sept. 13, 2018, Accepted Dec. 20, 2018)

## Abstract

Despite the high incidence of breast cancer and reports that many affected patients experience insomnia, few studies have addressed the incidence of insomnia among women who underwent breast cancer screening and biopsy. Accordingly, this study aimed to assess the prevalence of insomnia among women who have undergone breast cancer screening and biopsy and current breast cancer patients and identify correlations among insomnia, psychological distress, and quality of life in these populations. The participants were 193 women who visited the breast disease specialty clinic in Nagano, Japan. After stratifying the participants into breast cancer screening (n=102), breast biopsy (n=25), and breast cancer patient (n=66) groups.

Among all groups, 52-57% of the participants experienced insomnia (p=0.886). No significant differences in the mean HADS scores for anxiety (p=0.959) and depression (p=0.755) were observed among the three groups. Among breast cancer patients, several EORTC QLQ-C-30 items correlated with insomnia, whereas fewer such correlations were observed among participants undergoing breast cancer screening and breast biopsy. These findings suggest that women undergoing breast screening or biopsy experience similar psychological distress and insomnia as that reported by breast cancer patients. However, the quality of life of breast cancer patients was more strongly affected by insomnia, suggesting that this is a chronic factor in this population.

## Introduction

Breast cancer is the most common cancer among women worldwide. In Japan, approximately 89,400 women were newly diagnosed with this disease in 2015<sup>1)</sup>. Although patients recently

diagnosed with early-stage breast cancer have a 5-year survival rate above 90%, patients report insomnia as the most frequent and severe cluster of symptoms, followed by pain, fatigue, and depression<sup>2-4)</sup>.

Psychological stress is known to disturb

---

1) 佐久大学看護学部

sleep in both real-life and clinical situations<sup>5,6</sup>, and insomnia is a common psychophysiological response to situational stress, anxiety, and fear. Over time, chronic insomnia has various detrimental health effects, including altered metabolic and endocrine function<sup>7</sup> and hypothalamic-pituitary-adrenal (HPA) axis activity<sup>8,9</sup>. Insomnia also reduces the function of biological repair and immune mechanisms<sup>10</sup> and increases the risks of hypertension<sup>11</sup>, depression<sup>12-14</sup>, and heart disease<sup>15</sup>.

According to a review by Buysse insomnia affects approximately 10-20% of people in the general population<sup>16</sup>. In Japan, many women report experiencing insomnia caused by stressors such as nursing home care, working, and parenting (i.e., 24-hour lifestyle situations)<sup>17,18</sup>. Although several studies report that 21-26% of adult women (age: >20 years) have insomnia<sup>19,20</sup>, studies of cancer patients report rates of 30-75%, or twice as high as the rates in the general population<sup>21</sup>.

In addition to cancer patients, Kitano et al.<sup>22</sup> and Nelson et al.<sup>23</sup> reported that women undergoing breast cancer screening and Schnur et al.<sup>24</sup> reported that breast biopsy have very high levels of psychological stress. In brief, many women are likely to experience insomnia, defined as difficulty initiating or maintaining sleep, with underlying symptoms including difficulty falling asleep, difficulty staying asleep, early morning awakening, or non-restorative sleep during the past week. However, few studies have evaluated the prevalence of insomnia in this population. The present study, therefore, is the first to com-

pare the prevalence of insomnia among breast cancer patients and women undergoing breast cancer screening and biopsy. With this comparison, the study aims to assess not only the prevalence of insomnia, but also to identify correlations among insomnia, psychological distress, and the quality of life (QOL) among these three populations of women.

## Methods

### Research Design

This cross-sectional study was conducted from February 2016 through March 2017.

### Participants

Participants were recruited from the breast cancer specialty clinic in Nagano, Japan. The inclusion criteria were an age of  $\geq 20$  years and the ability to read and respond in writing to Japanese-language questionnaires. The exclusion criteria were a diagnosis of benign breast disease and non-breast examination. The same criteria were applied to women with and without a breast cancer diagnosis.

A total of 528 envelopes were distributed to potential study participants. Of these, 292 were returned to the researcher for a response rate of 55.3%. After applying the inclusion and exclusion criteria, 99 responses were excluded to yield a total of 193 completed data sets. The participants were subsequently divided into three groups depending on the purpose of their visit to the clinic: breast cancer patients ( $n=66$ , 34.2%), breast cancer screening ( $n=102$ , 52.8%), and precise breast cancer biopsy ( $n=25$ , 13.0%).

## Procedure

Survey participants were recruited via advertising posters placed on the wall of the clinic waiting room. The envelopes provided to potential participants included a paper copy of the survey outline, set of questionnaires, prepaid envelope, felt-tip pen for filling out the questionnaire, and reward (approximately 150 Japanese yen worth of bath salts). The participants were allowed to complete the survey in the waiting room or at home and were requested to mail completed questionnaires directly to the researcher. Only the attending physician, nurse, and researcher were aware of study participation. The return of a questionnaire to the researcher was considered to indicate consent to participate in the study. The study was approved by the Ethical Committee of Saku University (approval no.: 15-0003-04).

## Measures

The survey questionnaire comprised demographic, psychosocial, and clinical questions. Eligible participants were invited to complete the Hospital Anxiety and Depression Scale (HADS), Japanese version<sup>25)</sup>, the Japanese-language European Organization for Research and Treatment of Cancer QOL questionnaire (EORTC QLQ-C30) ver. 3.0, and questions to determine demographic data, the presence of insomnia, and psychosocial and clinical factors, such as age, employment, marital status, children, reason for visit, survival years, and social support.

Many studies have been conducted to evaluate anxiety and depression in cancer patients<sup>22,26,27)</sup>. The HADS is a major tool used to detect anxiety

and depression. It was developed in England to measure anxiety and depression levels in patients unaffected by physical symptoms at general outpatient clinics<sup>28)</sup>. The HADS consists of seven items related to anxiety and seven related to depression. Total scores of 0-7, 8-10, and  $\geq 11$  reflect 'non-cases', 'doubtful cases', and 'definite cases', respectively. Many studies have tested, summarized, and validated the HADS<sup>29)</sup>, and the Japanese version<sup>25)</sup> was validated in female university students and laborers<sup>30)</sup> in a gastrointestinal outpatient clinic<sup>31)</sup>.

Insomnia also affects the physical, mental, and social functioning aspects of the QOL, which is an important measure in cancer patients. To address the QOL, we used the Japanese-language EORTC QLQ-C30 ver. 3.0, a major health-related QOL assessment designed for cancer patients. The EORTC QLQ-C30 was developed by the European Organisation for Research and Treatment of Cancer and comprises 30 items<sup>32)</sup>, including a global health status/QOL scale, five functional scales (physical, role, emotional, cognitive, and social), three symptom scales (fatigue, nausea and vomiting, and pain), and six single scales (dyspnea, appetite loss, insomnia, constipation, diarrhea, and financial difficulties). This tool has been validated in many studies<sup>33)</sup>, including studies of the QOL of breast cancer patients<sup>27,34,35)</sup>. High scores on the functional scales indicate good health, while high scores on the symptom scales indicate health problems.

## Analyses

The three groups of participants were compared in terms of demographic, psychosocial, the

prevalence of insomnia, and clinical factors using a chi-squared test. The mean group HADS and EORTC QLQ-C30 scores in the groups were compared using a one-way analysis of variance. Multiple post hoc comparisons were corrected using Dunnett's method. Correlations of the presence of insomnia with HADS subscale scores and EORTC QLQ C-30 item scores were determined using Spearman's correlation coefficient analyses. Differences were considered to be significant at a level of 5%. The analyses were performed using SPSS, version 25.0 (IBM Japan, Tokyo, Japan).

## Results

### Socio-demographic and clinical characteristics

Table 1 presents the patients' socio-demographic and clinical characteristics stratified by the purpose of the visit to the clinic. The study participants had a mean ( $\pm$  standard deviation) age of  $51.4 \pm 10.8$  years and a median (range) age of 50.0 (20-77) years. Although patients in the breast screening group were significantly younger than those in other groups ( $p < 0.001$ ), the groups did not differ significantly in terms of employment, marital status, children younger than 12 years, and social support. Among breast cancer patients, the mean survival time was  $6.25 \pm 5.0$

**Table 1** Socio-demographic characteristics of the participants

N=193

N	Breast cancer screening 102		Breast cancer inspection 25		Breast cancer 66		p
	N	%	N	%	N	%	
Age (mean $\pm$ SD)	48.9 $\pm$ 10.3		49.2 $\pm$ 10.9		56.0 $\pm$ 10.0		<0.001**
Range	27-75		20-75		34-77		
Younger than 35 years	9	8.8	2	8.0	1	1.5	
Older than 65 years	10	9.8	1	4.0	16	24.2	
Employment							
Employed	80	78.4	19	76.0	44	66.7	0.229
Marital status							
Married	81	79.4	21	84.0	55	83.3	0.197
Divorce/bereavement	12	11.8	0	0	8	12.1	
Unmarried	9	8.8	4	16.0	3	4.5	
Has children younger than 12years	26	25.5	6	24.0	7	10.6	0.056
Has children older than 12years	35	34.3	12	48.0	33	50.0	0.102
Social support							
Husband	72	70.6	15	60.0	39	59.1	0.260
Parent	39	38.2	11	44.0	23	34.8	0.718
Child	60	58.8	15	60.0	39	59.1	0.994
Friend	51	50.0	8	32.0	29	43.9	0.255

Notes: SD = standard deviation \*\*  $p < 0.01$

years, and two patients (3.3%) survived for less than 1 year.

**Insomnia**

Fifty-eight (56.9%), 13 (52.0%), and 38 (57.6%) of patients in the breast cancer screening, biopsy, and patient groups, respectively, reported insomnia, including difficulty falling asleep, difficulty returning to sleep after awakening, or awakening too early with an inability to return to sleep. In other words, more than half of all participants in each group experienced insomnia, and no significant differences were observed among the groups (p=0.886).

Breast cancer patients had the highest mean insomnia score which is one of the item of EORTC QLQ C-30 item score of 19.7±26.8. The insomnia raw score was determined by how often insomnia occurred, as well as the response to ‘Have you had trouble sleeping?’, which had three possible answers: 1. Not at all, 2. A little, 3. Quite a bit, and 4. Very much. Of the screening, biopsy, and patient groups, 7.8%, 4.0%, and 10.6% respectively reported responses 3 and 4, while 38.2%, 44.0%, and 43.9% respectively reported responses of 2-4.

**HADS**

The three groups did not differ significantly in terms of the mean HADS score (anxiety: p=0.959, depression: p=0.755). Using a cut-off point of 7/8, 19-22% of patients in the three groups were classified as doubtful and definite cases (Table 2). Although there were no significant differences among the groups for percentage of doubtful and definite cases of HADS score (anxiety: p=0.895, depression: p=0.902).

**EORTC QLQ C-30**

Table 3 presents the mean EORTC QLQ C-30 scores. Surprisingly, breast cancer patients had the highest global health status score (70.3±21.6), although there were no significant differences among the groups (p=0.164). Significant inter-group differences were observed for the physical functioning (p=0.007), social functioning (p=0.025), diarrhea (p=0.007), and financial difficulties scale scores (p=0.003). The biopsy group had the highest diarrhea score (12.0±25.2), and the breast cancer patients group had the highest financial difficulties score (22.7±31.6).

**Table 2 Comparison and distribution of mean HADS scores**

		0-7			≥ 8		F-test	χ <sup>2</sup> test
		Mean	SD	N	%	N		
HADS-anxiety	Screening	5.3	±3.4	79	77.5	23	22.5	p=0.959
	Biopsy	5.2	±3.6	20	80.0	5	20.0	
	Breast cancer	5.1	±2.8	53	80.3	13	19.7	
HADS-depression	Screening	4.7	±3.4	81	79.4	21	20.6	p=0.755
	Biopsy	5.2	±4.2	19	72.7	6	24.0	
	Breast cancer	4.6	±3.1	53	82.0	13	19.7	

Notes: HADS = Hospital Anxiety and Depression Scale; SD = standars deviation

**Table 3 Comparison of mean EORTC QLQ C-30 item scores among patients in the screening, biopsy, and breast cancer groups**

	Screening		Biopsy		Breast cancer		p
	N=102		N=25		N=66		
	Mean	SD	Mean	SD	Mean	SD	
Global health status/QOL	64.4 ± 22.1		62.3 ± 20.6		70.3 ± 21.6		0.164
Physical functioning	92.5 ± 9.7		92.3 ± 9.4		87.3 ± 12.7		0.007 **
Role functioning	93.3 ± 15.2		92.0 ± 15.3		92.2 ± 14.7		0.863
Emotional functioning	77.5 ± 18.8		75.7 ± 16.3		80.2 ± 17.3		0.490
Cognitive functioning	75.8 ± 20.0		78.0 ± 21.4		74.5 ± 16.1		0.727
Social functioning	91.2 ± 17.7		80.0 ± 28.5		85.6 ± 19.6		0.025 *
Fatigue	30.3 ± 20.0		36.4 ± 21.2		31.1 ± 20.0		0.391
Nausea and vomiting	4.1 ± 11.8		2.0 ± 5.5		0.8 ± 3.5		0.065
Pain	19.4 ± 23.3		20.0 ± 21.5		21.7 ± 21.1		0.811
Dyspnea	7.5 ± 17.6		9.3 ± 15.3		9.6 ± 16.3		0.613
Insomnia	16.3 ± 24.3		16.00 ± 19.5		19.7 ± 26.8		0.656
Appetite loss	7.8 ± 16.4		9.3 ± 15.3		7.1 ± 13.7		0.820
Constipation	15.4 ± 24.2		21.3 ± 31.7		16.7 ± 23.6		0.567
Diarrhea	7.2 ± 17.9		12.0 ± 25.2		1.0 ± 5.8		0.007 **
Financial difficulties	9.5 ± 19.6		20.0 ± 28.9		22.7 ± 31.6		0.003 **

Notes: EORTC QLQ C-30 = European Organization for Research and Treatment of Cancer Quality of Life Questionnaire; SD=standard deviation; QOL=quality of life \* p<0.05; \*\* p<0.01

### Correlation insomnia and HADS, EORTC QLQ C-30

Table 4 presents the results of a correlation analysis of insomnia, the HADS subscale scores, and the EORTC QLQ C-30 item scores. Only weak correlations were observed between the HADS subscale score and insomnia ( $r=0.232-0.263$ ) in the screening group, and insomnia correlated with only depression among breast cancer patients ( $r=0.506$ ). Furthermore, only two EORTC QLQ C-30 items correlated with insomnia in the screening group, while three and seven items correlated with insomnia in the biopsy and breast cancer patient groups.

### Discussion

In this study, we observed an approximately 50% prevalence of insomnia, which was attributed to several types of sleep disturbance. Although we observed the highest mean EORTC QLQ C-30 insomnia raw score among breast cancer patients in our study, this parameter did not differ significantly among the groups. This prevalence of insomnia was approximately two- to three-fold higher than the rates reported by previous studies conducted among Japanese women (14.4-26%)<sup>19,20,36</sup> but was consistent with previous studies in which the prevalence of insomnia was approximately two- to three-fold higher among cancer patients relative to the general population<sup>21,37</sup>. Despite these observations, no previous study has used the same tools to eval-

**Table 4 Spearman correlations of insomnia with EORTC QLQ C-30 scores**

	Screening	Biopsy	Breast cancer
Global health status/QOL			-0.306 *
Physical functioning	0.231 *		
Role functioning			
Emotional functioning		-0.459 *	-0.456 *
Cognitive functioning			-0.393 *
Social functioning		-0.505 *	-0.331 *
Fatigue	0.24 *		0.357 *
Nausea and vomiting			
Pain			0.243 *
Dyspnea			
Appetite loss			0.295 *
Constipation			
Diarrhea			
Financial difficulties		0.396 *	
HADS-anxiety	0.232 *		
HADS-depression	0.263 **		0.506 **

Notes: Data are shown as R values. EORTC QLQ C-30 = European Organization for Research and Treatment of Cancer Quality of Life Questionnaire; QOL = quality of life; HADS = Hospital Anxiety and Depression Scale  
\*  $p < 0.05$ ; \*\*  $p < 0.01$

uate the prevalence of insomnia among patients with breast cancer, as well as those undergoing breast cancer screening and biopsy.

On the other hand, the present study observed a prevalence of anxiety or depression of 19.7% among breast cancer patients, which was slightly higher than the rate reported by Akechi et al.<sup>38)</sup> but within the range of 10-25% reported by Fann et al.<sup>39)</sup> regarding the prevalence of depression among breast cancer patients.

Although the correlation between insomnia and each item of the EORTC QLQ C-30 was weak in the screening group, moderate correlation was found between emotional function and social function in the biopsy group. In using the EORTC QLQ C-30 for breast cancer patients before surgery, Denieffe et al.<sup>40)</sup> found that “fatigue,” “depression,” “pain,” and “sleep disturbance” were inter-related symptom clusters,

and similar to our research, these clusters were weakly correlated with emotional function and social function. In the group of breast cancer patients, “insomnia” correlated with “fatigue,” “pain,” and “depression;” therefore, it turned out that these factors were affecting each other as a cluster. In addition, we acknowledged that breast cancer patients were continuously suffering from stress, because correlations were found not only with regard to physical aspects but also with emotional, cognitive, and social functions.

Screening and biopsy are temporary events and are thus considered acute stressors, whereas breast cancer patients may experience chronic insomnia due to continuous stress. This chronic nature may affect many QOL items. However, we were not able to clarify whether the similar prevalence of insomnia in breast cancer patients relative to other groups indicates that women who



experience acute insomnia attributable to screening or biopsy will develop chronic insomnia following a breast cancer diagnosis. This topic should be addressed in future research.

This study had some limitations of note. The total number of participants may not be sufficient for analyses among the groups, and the questionnaires were completed either at the clinic or after going home. Accordingly, some of the patients responded to the questionnaire after receiving a diagnosis of non-cancer, despite that some studies have shown that patients who undergo a breast tumor biopsy experience high levels of anxiety and depression before receiving a diagnosis. Furthermore, this study did not investigate whether the cancer stage, treatment type, or menopausal/post-menopausal status affected the prevalence of insomnia.

#### Conflict of interest

None declared.

#### Funding

This study was supported by the Japan Society for the Promotion of Science Grant-in-Aid for Scientific Research (C), Grant Number: JP26463360.

#### References

- 1) Cancer Statistics in Japan (2016). *Foundation for Promotion of Cancer Research*. Retrieved from [http://ganjoho.jp/data/reg\\_stat/statistics/brochure/2015/cancer\\_statistics\\_2015\\_date\\_J.pdf](http://ganjoho.jp/data/reg_stat/statistics/brochure/2015/cancer_statistics_2015_date_J.pdf)
- 2) Ho, S.-Y., Rohan, K. J., Parent, J., Tager, F. A., & McKinly, P. S. (2015). A longitudinal study of depression, fatigue, and sleep disturbances as a symptom cluster in women with breast cancer. *Journal of Pain and Symptom Management*, 49, 707-715.
- 3) Fiorentino, L., Rissing, M., Liu, L., & Ancoli-Israel, S. (2011). The symptom cluster of sleep, fatigue and depressive symptoms in breast cancer patients: Severity of the problem and treatment options. *Drug Discovery Today Disease Models*, 8, 167-173.
- 4) Sarenmalm, E. K., Browall, M., & Gaston-Johansson, F. (2014). Symptom burden clusters: A challenge for targeted symptom management. A longitudinal study examining symptom burden clusters in breast cancer. *Journal of Pain and Symptom Management*, 47, 731-741.
- 5) Budhrani, P. H., Lengacher, C. A., Kip, K., Tofthagen, C., & Jim, H. (2015). An integrative review of subjective and objective measures of sleep disturbances in breast cancer survivors. *Clinical Journal of Oncology Nursing*, 19, 185-191.
- 6) Dooyoung, J., Lee, K. M., Kim, W. H., Lee, J. Y., Kim, T. Y., Im, S. A., ... Harm, B. J. (2016). Longitudinal association of poor sleep quality with chemotherapy-induced nausea and vomiting in patients with breast cancer. *Psychosomatic Medicine*, 78, 959-965.
- 7) Hirotsu, C., Tufik, S., & Andersen, M. L. (2015). Interactions between sleep, stress, and metabolism: From physiological to pathological conditions. *Sleep Science*, 8, 143-152.
- 8) Burckley, T. M., & Schatzberg, A. F. (2005). On the interactions of the hypothalamic-pituitary-adrenal (HPA) axis and sleep: Normal HPA axis activity and circadian rhythm, exemplary. *Journal of Clinical Endocrinology & Metabolism*, 90, 3106-3114.
- 9) Han, K. S., Kim, L., & Shim, I. (2012). Stress and sleep disorder. *Experimental Neurobiology*, 21, 141-150.
- 10) Majde, J. A., & Krueger, J. M. (2005). Links between the innate immune system and sleep. *Journal of Allergy and Clinical Immunology*, 116, 1188-1198.
- 11) Thomas, S. J., & Calhoun, D. (2017). Sleep, insomnia, and hypertension: Current findings and future directions. *Journal of the American Society of Hypertension*, 11, 122-129.
- 12) Nishitani, N., Kawasaki, Y., & Sakakibara, H. (2018). Insomnia and depression: Risk factors for development of depression in male Japanese workers

- during 2011-2013. *International Journal of Health*, 63, 49-55.
- 13) Li, L., Wu, C., Gan, Y., Qu, X., & Lu, Z. (2016). Insomnia and the risk of depression: A meta-analysis of prospective cohort studies. *BMC Psychiatry*, 16, 375.
  - 14) Fernandez-Mendoza, J., Shea, S., Vgontzas, A. N., Calhoun, S. L., Liao, D., & Bixler, E. O. (2015). Insomnia and incident depression: Role of objective sleep duration and natural history. *Journal of Sleep Research*, 24, 390-398.
  - 15) Javaheri, S., & Redine, S. (2017). Insomnia and risk of cardiovascular disease. *Chest*, 152, 435-444.
  - 16) Buysse, D. J. (2013). Insomnia. *Journal of the American Medical Association*, 20, 706-716.
  - 17) Tokiya, M., Kaneita, Y., Itani, O., Jike, M., & Ohida, T. (2016). Predictors of insomnia onset in adolescents in Japan. *Sleep Medicine*, 38, 37-43.
  - 18) Wyse, C., Carlos, A., Morales, C., Graham, N., Fan, Y., Ward, J., ... Pell, J. P. (2017). Adverse metabolic and mental health outcomes associated with shiftwork in a population-based study of 277,168 workers in UK biobank. *Annals of Medicine*, 49, 411-420.
  - 19) Komada, Y., Nomura, T., Kusumi, M., Nakashima, K., Okajima, I., Sasai, T., & Inoue, Y. (2011). Correlations among insomnia symptoms, sleep medication use and depressive symptoms. *Psychiatry and Clinical Neurosciences*, 65, 20-29.
  - 20) Kim, K., Uchiyama, M., Okawa, M., Liu, Z., & Ogi-hara, R. (2000). An epidemiological study of insomnia among the Japanese general population. *Sleep*, 23, 1-7.
  - 21) Howell, D., Oliver, T. K., Keller-Olaman, S., Davidson, J. R., Garland, S., Samuels, C., ... Taylor, C. (2014). Sleep disturbance in adults with cancer: A systematic review of evidence for best practices in assessment and management clinical practice. *Annals of Oncology*, 25, 791-800.
  - 22) Kitano, A., Yamauchi, H., Hosaka, T., Yagata, H., Hosokawa, K., Ohde, S., ... Tsunoda, H. (2015). Psychological impact of breast cancer screening in Japan. *International Journal of Clinical Oncology*, 20, 1110-1116.
  - 23) Nelson, H., Pappas, M., Canter, A., Griffin, J., Daeges, M., & Humphrey, L. (2016). Harms of breast cancer screening: Systematic review to update the 2009 U.S. preventive services task force recommendation. *Annals of Internal Medicine*, 164, 256-267.
  - 24) Schnur, J. B., Montgomery, G. H., Hallquist, M. N., Goldfarb, A. B., Silverstein, J. H., Wetz, C. R., ... Bovbjerg, D. H. (2008). Anticipatory psychological distress in women scheduled for diagnostic and curative breast cancer surgery. *International Journal of Behavioral Medicine*, 15, 21-28.
  - 25) Kitamura, T. (1993). Hospital anxiety and depression scale. *Archives of psychiatric diagnostics and clinical evaluation*, 993, 371-372. [Japanese]
  - 26) Hinz, A., Krauss, O., Hauss, J. P., Höckel, M., Kortmann, R. D., Stolzenburg, J. U., & Schwarz, R. (2010). Anxiety and depression in cancer patients compared with the general population. *European Journal of Cancer Care*, 19, 522-529.
  - 27) Schleife, H., Sachtleben, C., Barboza, C. F., Singer, S., & Hinz, A. (2014). Anxiety, depression, and quality of life in German ambulatory breast cancer patients. *Breast Cancer*, 21, 208-213.
  - 28) Zigmond, A. S., & Snaith, R. P. (1983). The hospital anxiety and depression Scale. *Acta Psychiatrica Scandinavica*, 67, 361-370.
  - 29) Bjelland, B., Dahl, A. A., Haug, T. T., & Neckelmann, D. (2002). The validity of the hospital and depression scale an updated literature review. *Journal of Psychosomatic Research*, 52, 69-77.
  - 30) Hatta, H., Higashi, A., Yashiro, H., Ozasa, K., Hayashi, K., Kiyota, K., ... Kawai, K. (1998). A validation of the hospital anxiety and depression scale. *Japanese Journal of Psychosomatic Medicine*, 38, 309-315. [Japanese]
  - 31) Higashi, A., Yashiro, H., Kiyota, K., Inokuchi, H., Hatta, H., Fujita, K., ... Kawai, K. (1996). Validation of the hospital anxiety and depression scale in a gastro-intestinal clinic. *Japanese Journal of Gastroenterological Surgery*, 93, 884-892. [Japanese]
  - 32) Aaronson, N. K., Ahmedzai, S., Bergman, B., Bullinger, M., Cull, A., Duez, N. Z., ... Takeda, F. (1993). The European organization for research and treatment of cancer QLQ-C30: A quality-of-life instrument for use in international clinical trials in oncology. *Journal of the National Cancer Institute*, 85, 365-376.
  - 33) Groenvold, M., Klee, M. C., Sprangers, M. A. G., &

- Aaronson, N. K. (1997). Validation of the EORTC QLQ-C30 quality of life questionnaire through combined qualitative and quantitative assessment of patient-observer agreement. *Journal of Clinical Epidemiology*, *50*, 441-450.
- 34) Fischer, M. J., Inoue, K., Matsuda, M., Kroep, J. R., Nagai, S., Tozuka, K., ... Kaptein, A. A. (2017). Cross-cultural comparison of breast cancer patients' Quality of Life in the Netherlands and Japan. *Breast Cancer Research and Treatment*, *166*, 459-471.
- 35) Schou, I., Ekeberg, Ø., Ruland, C. M., Sandvik, L., & Kåresen, R. (2005). Pessimism as a predictor of emotional morbidity one year following breast cancer surgery. *Psycho-Oncology*, *13*, 309-320.
- 36) Doi, Y., Minowa, M., Okawa, M., & Uchitomi, M. (2000). Prevalence of sleep disturbance and hypnotic medication use in relation to sociodemographic factors in general Japanese adult population. *Journal of Epidemiology*, *10*, 79-86.
- 37) Liu, L., & Ancoli-Israel, A. (2008). Sleep disturbances in cancer. *Psychiatric Annals*, *38*, 627-634.
- 38) Akechi, T., Okuyama, T., Imoto, S., Yamazaki, S., & Uchitomi, Y. (2001). Biomedical and psychosocial determinants of psychiatric morbidity among postoperative ambulatory breast cancer patients. *Breast Cancer Research and Treatment*, *65*, 195-202.
- 39) Fann, J. R., Thomas-Rich, A. M., Katon, W. J., Cowley, D., Pepping, M., McGregor, B. A., & Gralow, J. (2008). Major depression after breast cancer: A review of epidemiology and treatment. *General Hospital Psychiatry*, *30*, 112-126.
- 40) Denieffe, S., Gowman, S., Gooney, M. (2013). Symptoms, clusters and quality of life prior to surgery for breast cancer. *Journal of Clinical Nursing*, *23*, 2491-2502.