RESEARCH ARTICLE

Association between sleep quality, anxiety and depression among Korean breast cancer survivors

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Abstract

Aim: This study aimed to examine the sleep pattern of breast cancer survivors and anxiety and depression associated with sleep quality to provide evidence-based information for the development of interventions to improve sleep disorders in these survivors.

Design: A cross-sectional study.

Methods: The subjects were 266 breast cancer survivors in South Korea. Structured questionnaires regarding sleep quality, anxiety and depression were used. The data were analysed using t test, ANOVA and multiple regression analysis.

Results: Sleep duration and sleep disturbance were found to affect anxiety, whereas sleep latency and subjective sleep quality were found to affect depression. These results suggest that various factors affecting sleep quality should be considered when providing care for anxiety and depression in breast cancer survivors.

KEYWORDS

anxiety, cancer survivors, depression, nurses, nursing, sleep

1 | INTRODUCTION

Breast cancer is the most common cancer among women in South Korea, having increased by 4.7% every year from 2002–2017. The 5-year survival rate increased from 88.6% in 2001–2005%–93.2% in 2013–2017 (Ministry of Health and Welfare, Korea Central Cancer Registry, & National Cancer Center, 2019), and as the breast cancer survival rate increases, interest in the physical and emotional aspects of the quality of life of the survivors is also increasing.

Breast cancer patients are treated with surgery and radiation therapy, adjuvant chemotherapy, hormone therapy and targeted therapy, depending on the stage of the disease (American Cancer Society, 2019). Breast cancer survivors are those who survive cancer after the completion of treatment and include those women on long-term follow-up to reduce the risk of recurrence or secondary cancer and to improve health (American Society of Clinical Oncology, 2019). Breast cancer survivors suffer from late side effects, such as insomnia,

fatigue, arthralgia, tingling in the hands and feet and numbness, as well as emotional symptoms such as anxiety and depression (Palmer et al., 2016), and also experience a great deal of stress in adapting to changes in body image, environment and daily life during the treatment (American Society of Clinical Oncology, 2019). They want and need various interventions to help with these issues (Palmer et al., 2016).

Previous studies regarding sleep quality in breast cancer survivors have shown that they had shorter sleeping duration compared with normal women (Carpenter et al., 2004), experienced changes in sleep duration such as hypersomnia or shortening of sleep duration after chemotherapy (Park et al., 2009), experienced restless legs syndrome and symptoms related to parasomnia or sleep apnoea in addition to insomnia (Otte et al., 2016). These sleep disorders were found to be associated with decreased physical function and emotional states such as depressive symptoms and distress (Carpenter et al., 2004), while low sleep quality was found to be associated with

higher levels of anxiety and depression (Inhestern et al., 2017; Park et al., 2009).

Anxiety and depression were the most common problems experienced by breast cancer survivors (Palmer et al., 2016); prevalence rates among long-term breast cancer survivors are 17.9% and 11.6%, respectively (Mitchell et al., 2013). Breast cancer survivors were hardly able to accept the fact that they had cancer, even after the completion of treatment and were depressed and afraid of the possibility of metastasis or recurrence and not recovering quickly (Lee et al., 2013). Decreased levels of physical activity and various symptoms due to the side effects of treatment in breast cancer survivors may aggravate depression or have negative effects on their outlook on the future and their body image (Galiano-Castillo et al., 2014).

In breast cancer survivors, sleep disorder and anxiety or depression often do not occur separately, but rather co-occur simultaneously and interact with each other to reduce health-related quality of life (Fiorentino et al., 2011). Insomnia is one of the factors that causes depression, is a potential indicator of depression (Guo et al., 2006) and can impair immune or metabolic function in breast cancer survivors, negatively affecting quality of life or prognosis (Ban & Lee, 2013). Therefore, it is necessary that sleep quality be actively evaluated and managed. However, patients and caregivers tend to neglect sleep disturbance, as opposed to problems related to pain or treatment and often do not evaluate and treat sleep disturbances adequately (Mystakidou et al., 2007).

Recently, studies have investigated the relationship between physical and emotional symptoms and quality of life in breast cancer survivors (Lee et al., 2014; Park et al., 2009). There have also been studies investigating whether depression is a factor affecting sleep disorder (Carpenter et al., 2004) and identifying the relationship between anxiety and sleep disorder (Schreier et al., 2019). This study aimed to investigate the effects of sleep quality on anxiety or depression in breast cancer survivors and to provide evidence-based information for the development of interventions to improve sleep disorders in these survivors.

This study aimed to examine the sleep pattern of breast cancer survivors and anxiety and depression associated with sleep quality to provide evidence-based information for the development of interventions to improve sleep disorders in these survivors. Therefore, the purposes of this study were as follows: (a) to examine the levels of sleep quality, anxiety and depression of breast cancer survivors, and (b) to identify the association between sleep quality, anxiety and depression among Korean breast cancer survivors.

2 | METHODS

2.1 | Study design and participants

This was a descriptive study aimed at investigating the effects of sleep quality on anxiety and depression in breast cancer survivors, through the use of a questionnaire.

The subjects of this study were 266 breast cancer survivors aged 18 years or older who participated in breast cancer patient self-help groups at five tertiary hospital in South Korea and had completed postoperative adjuvant chemotherapy or radiotherapy at least 6 months previously. Those who refused to participate in this study, had mental illness or had difficulty communicating were excluded. The number of subjects required for regression analysis in this study was calculated using the G*Power 3.1 program. When the number of predictive variables was 24, the significance level was 0.05, the power was 0.95, and the effect size was 0.15, and the number of subjects required was 238 (Faul et al., 2009). Questionnaires were distributed to 280 subjects (taking potential dropout rate into consideration); 266 subjects were finally selected for this study, excluding 14 subjects with incomplete information.

2.2 | Study instruments

2.2.1 | Sleep quality

Sleep quality was measured using questions about feeling refreshed when waking up in the morning, regular bedtimes and napping and the Pittsburgh Sleep Quality Index (PSQI) developed by Buysse et al. (1989). The PSQI is a 4-point scale (0–3 points) consisting of 19 items with the seven subdomains of subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, hypnotics use and daytime dysfunction and the score ranges from 0–21 points. A higher score indicates lower sleep quality. Those with a global score of 5 or less are regarded as good sleepers and those with a score of 5 or over as poor sleepers. The reliability of the tool was a Cronbach α of 0.86 at the time of the development of the tool, and it was measured as 0.83 in this study.

2.2.2 | Anxiety and depression

Anxiety and depression were measured by the Korean version of the Hospital Anxiety and Depression Scale (HADS), originally developed by Zigmond and Snaith (1983). The HADS is a 14-item, 4-point scale (from 0 for none to 3 points for severe level), consisting of an anxiety scale (7 items, HADS-A) and depression scale (7 items, HADS-D); the score for each domain ranges from 0–21 points. A higher score indicates a higher level of anxiety or depression. A score of 7 points or lower for each domain was classified as having no symptoms, a score of 8–10 points was classified as mild anxiety or depression, and a score of 11 points or higher was classified as moderate anxiety or depression (evidence presented). The reliability of this tool was shown by a Cronbach α of 0.87 for depression and 0.82 for anxiety.

2.3 | Data collection

Data were collected between March–July 2016. The subjects were recruited in breast cancer patient self-help groups meetings held at five tertiary hospitals. Questionnaire completion required approximately 20–30 min. Respondents received a small token of appreciation at follow-up visits. This was a self-reported survey completed by participants.

2.4 | Ethics approvals

Ethics approvals were obtained from Human Research Ethics Committee (project no. KNU 2015-29) prior to study commencement. Informed consent to participate was obtained after the study contents, purposes and protocols, data confidentiality and anonymity procedures, and participants' freedom to discontinue the study had been explained.

2.5 | Data analysis

Data were analysed using the SAS statistical program. The demographics and clinical characteristics of the subjects, sleep quality and levels of anxiety and depression were presented as frequency and percentage, mean and standard deviation. Differences in anxiety and depression according to the characteristics of the subjects were investigated using the t test and ANOVA, and the effects of sleep quality on anxiety or depression were investigated using multiple regression analysis.

3 | RESULTS

3.1 | Sociodemographic and disease-related characteristics of the participants

The mean age of the subjects was 52.9 years, with most (67.3%) aged 50 years or older; 83.5% had a spouse, and 78.2% had no job. In addition, 66.2% had a household income of more than KRW 2 million, 72.9% were high school graduates, 73.3% had a religion, and 60.2% had a body mass index of less than 23 kg/m². In addition, 81.6% were postmenopausal women and 84.2% had stage II or below breast cancer. The mean time since operation was 70.8 months, and in 51.5%, less than 60 months had elapsed since surgery. The percentages of those who previously received postoperative chemotherapy, radiotherapy and hormone therapy were 83.4%, 54.1% and 48.9%, respectively, and the percentage of those who were currently receiving hormone therapy was 41.4% (Table 1).

3.2 | Levels of sleep quality, anxiety and depression

The total PSQI score was 8.04 points, and the proportions of those who reported feeling refreshed when waking up in the morning,

TABLE 1 Sociodemographic and disease-related characteristics of the participants (N = 266)

Characteristics	Categories	n (%) or M ± SD (range)
Age (years)		52.9 ± 7.0 (34 ~ 74)
	<50	87 (32.7)
	≥50	179 (67.3)
Spouse	Yes	222 (83.5)
	No	44 (16.5)
Job	Yes	58 (21.8)
	No	208 (78.2)
Income	<200	90 (33.8)
	≥200	176 (66.2)
Education	High school	194 (72.9)
	≥College	72 (27.1)
Religion	Yes	195 (73.3)
	No	71 (26.7)
Body mass index (kg/m²)	<23	160 (60.2)
	≥23	106 (39.8)
Menopause	Yes	217 (81.6)
	No	49 (18.4)
Stage of cancer	I	105 (39.5)
	II	119 (44.7)
	III	42 (15.8)
Duration since operation (months)		70.8 ± 47.6 (7 ~ 226)
	7–24	45 (16.9)
	25–60	92 (34.6)
	61–120	91 (34.2)
	≥121	38 (14.3)
Previous chemotherapy	Yes	222 (83.4)
	No	44 (16.5)
Previous radiation therapy	Yes	144 (54.1)
	No	122 (45.9)
Previous hormone therapy	Yes	130 (48.9)
	No	136 (51.1)
Current hormone therapy	Yes	110 (41.4)
	No	156 (58.6)

those who reported having a regular bedtime and those who reported napping were 61.7%, 30.5% and 36.1%, respectively. The proportion of those with low sleep quality (poor sleepers) was 72.2%.

The score for anxiety was 6.89 out of 21 points, and 15.0% had moderate anxiety (more than 11 points). The score for depression was 6.60 out of 21 points, and 15.8% had moderate depression (more than 11 points; Table 2).

The anxiety level was higher in those who underwent surgery less than 60 months previously (7.55 – 7.68 points) than in those

where the time since operation was more than 121 months (5.50 points). The anxiety level was also higher in those currently receiving hormone therapy (7.54 points) than in those who were not (6.44 points).

The level of depression was higher in those with no job (6.94 points) than those with a job (5.39 points) (Table 3); it was also higher in those who underwent surgery less than 60 months previously (7.34 – 0.35 points), than in those where duration since operation was 121 months (5.57 points). The level of depression was also higher in those currently receiving hormone therapy (7.36 points) than those not currently receiving such therapy (6.07 points) and higher in those who previously received chemotherapy or radiation therapy than in those who did not (Table 3).

TABLE 2 Levels of sleep quality, anxiety and depression (N = 266)

Variables	M ± SD or n (%)
Feeling refreshed after sleep	
Yes	164 (61.7)
No	102 (38.3)
Regular bedtime	
Yes	105 (30.5)
No	161 (60.5)
Daytime napping	
Yes	96 (36.1)
No	170 (63.9)
PSQI	
Subjective sleep quality	1.12 ± 0.78
Sleep latency	1.37 ± 0.79
Sleep duration	1.50 ± 1.10
Habitual sleep efficiency	0.67 ± 1.09
Sleep disturbance	1.42 ± 0.57
Sleep medication use	0.36 ± 0.68
Daytime dysfunction	1.61 ± 0.67
PSQI global scores	8.04 ± 3.50
Good sleeper	74 (27.8)
Poor sleeper	192 (72.2)
HADS-Anxiety	6.89 ± 3.63
<8	178 (66.9)
8–10	48 (18.1)
≥11	40 (15.0)
HADS-Depression	6.60 ± 3.84
<8	176 (66.1)
8–10	48 (18.1)
≥11	42 (15.8)

Abbreviations: HADS, Hospital Anxiety and Depression Scale; PSQI, Pittsburgh Sleep Quality Index.

3.3 | Association between sleep quality, anxiety and depression

The results of regression models for anxiety and depression calculated using the sleep quality variable were all significant. Among the sleep quality factors, the explanatory power for anxiety was the highest for daytime dysfunction, followed by feeling refreshed when waking up in the morning, sleep duration and sleep disturbance. Of the sleep quality factors, the explanatory power for depression was highest for feeling refreshed when waking up in the morning, followed by daytime dysfunction, sleep latency and subjective sleep quality (Table 4).

4 | DISCUSSION

This study examined sleep quality factors affecting anxiety and depression in breast cancer survivors, and the results showed that the total PSQI score in breast cancer survivors was 8.04 out of 21 points, and 72.2% were poor sleepers. These results indicate that the level of sleep quality found in this study (8.04 points) was lower than that in breast cancer survivors in the United States of America (USA) (7.33 points) (Carpenter et al., 2004) and that the proportion of poor sleepers in this study (72.2%) was higher than that in breast cancer survivors in the USA (53.0%). A previous study reported that hot flashes associated with menopause and the residual effects of cancer treatment were factors related to sleep disorder in breast cancer survivors (Carpenter et al., 2004; Otte et al., 2010). The percentage of postmenopausal women among the subjects of this study was 81.6%, which was higher than the 60.0% in the study by Carpenter et al. (2004), suggesting that sleep quality was lower.

In this study, 61.7% reported feeling refreshed when waking up in the morning, 30.5% reported having a regular bedtime, and 36.1% reported napping. Breast cancer survivors who received chemotherapy or radiotherapy do not sleep easily, due to residual effects related to cancer therapy or hot flashes, or they cannot get a good night's rest owing to being awake at night (Budhrani et al., 2015). Therefore, it is presumed that they do not experience feeling refreshed in the morning or that they supplement their insufficient sleep by napping.

The results of this study showed that the score for the level of anxiety in breast cancer survivors was 6.89 out of 21 points, and 15.0% had moderate anxiety, with a score of more than 11 points. This was lower than the level of anxiety (8.49 points) in female cancer patients and lower than the 30.9% who had moderate anxiety (Seok & Jun, 2016), while being similar to the level of anxiety (6.8 points) experienced by cancer survivors aged 25–55 years (Inhestern et al., 2017). A study by Akechi et al. (2015) found the proportion of those with moderate anxiety among breast cancer survivors to be 14.0%, which was like the results of this study.

Because breast cancer survivors often wake up at night, they feel less refreshed and they experience daytime somnolence and difficulties in daily life, due to reduced duration of sleep; they are worried about the possibility of breast cancer recurrence (Akechi

Characteristics	HADS-Anxiety		HADS-Depression	
	M (SD)	t/F (p)	M (SD)	t/F (p)
Age (years)				
<50	6.51 (3.18)	−1.16 (.248)	5.90 (3.55)	−2.09 (.037)
≥50	7.07 (3.82)		6.95 (3.94)	
Spouse				
Yes	6.89 (3.60)	0.01 (.996)	6.54 (3.72)	−0.57 (.568)
No	6.89 (3.80)		6.91 (4.45)	
Job				
Yes	6.31 (3.31)	−1.38 (.169)	5.39 (3.09)	−3.14 (.002)
No	7.05 (3.70)		6.94 (3.97)	
Income (million won)				
<200	6.65 (3.72)	−0.77 (.445)	6.59 (3.94)	−0.03 (.978)
≥200	7.01 (3.59)		6.60 (3.81)	
Education				
High school	6.93 (3.76)	0.30 (.761)	6.74 (3.95)	0.98 (.328)
≥College	6.78 (3.27)		6.22 (3.55)	
Religion				
Yes	6.83 (3.55)	−0.45 (.654)	6.48 (3.98)	−0.84 (.401)
No	7.06 (3.87)		6.94 (4.04)	
Body mass index (kg/m^2)				
<23	7.08 (3.61)	1.05 (.295)	6.77 (6.38)	0.89 (.376)
≥23	6.60 (3.68)		6.34 (4.08)	
Menopause				
Yes	7.00 (3.75)	1.03 (.304)	6.75 (3.88)	1.34 (.182)
No	6.41 (3.04)		5.94 (3.64)	
Stage of cancer				
I	6.35 (3.21)	2.05 (.130)	5.91 (3.51)	2.87 (.059)
II	7.32 (3.90)		7.12 (3.92)	
III	7.03 (3.73)		6.88 (4.26)	
Duration since operation (months)				
7–24[a]	7.55 (3.93)	4.57 (.004)	7.34 (4.19)	3.60 (.014)
25–60[b]	7.68 (3.89)	a,b > d	7.35 (3.99)	a,b > d
61–120[c]	6.37 (3.41)		5.92 (3.57)	
≥121[d]	5.50 (2.45)		5.57 (3.23)	
Treatment				
Previous chemotherapy				
Yes	6.97 (3.68)	0.78 (.437)	6.82 (3.92)	2.05 (.041)
No	6.50 (3.38)		5.52 (3.25)	
Previous radiation therapy				
Yes	7.09 (3.66)	0.84 (.404)	7.12 (4.04)	1.98 (.048)
No	6.71 (3.60)		6.17 (3.64)	
Previous hormone therapy				
Yes	7.03 (3.77)	0.62 (.537)	6.67 (4.05)	0.30 (.767)
No	6.75 (3.50)		6.53 (3.65)	
Current hormone therapy				
Yes	7.54 (4.01)	2.36 (.019)	7.36 (4.38)	2.56 (.011)
No	6.44 (3.27)		6.07 (3.34)	

TABLE 3 Differences in anxiety and depression according to characteristics (N = 266)

Abbreviation: HADS, Hospital Anxiety and Depression Scale.

TABLE 4 Association between sleep quality, anxiety and depression (N = 266)

Sleep quality	HADS-Anxiety		HADS-Depression	
	β (SE)	t (p)	β (SE)	t (p)
Feeling refreshed after sleep (ref.=no)	−0.19 (0.49)	−2.96 (.003)	−0.28 (0.50)	−4.50 (<.001)
Regular bedtime (ref.=no)	0.06 (0.46)	0.93 (.356)	0.06 (0.48)	1.00 (.319)
Daytime napping (ref.=no)	−0.04 (0.42)	−0.76 (.451)	−0.01(0.43)	−0.23 (.820)
PSQI components				
Subjective sleep quality	0.05 (0.32)	0.71 (.478)	0.13 (0.33)	2.05 (.042)
Sleep latency	0.10 (0.34)	1.35 (.178)	0.15 (0.35)	2.07 (.040)
Sleep duration	−0.16 (0.26)	−2.04 (.042)	−0.15 (0.27)	−1.90 (.059)
Habitual sleep efficiency	0.03 (0.25)	0.04 (.687)	0.01 (0.26)	0.20 (.839)
Sleep disturbance	0.16 (0.41)	2.51 (.013)	0.09 (0.42)	1.53 (.128)
Sleep medication use	−0.04 (0.34)	0.63 (.530)	−0.06 (0.35)	−0.93 (.351)
Daytime dysfunction	0.26 (0.39)	3.65 (<.001)	0.19 (0.40)	2.78 (.006)
R^2	.26		.31	
Adjusted R^2	.23		.28	
F (p)	8.67 (<.001)		11.06 (<.001)	

Abbreviations: HADS, Hospital Anxiety and Depression Scale; PSQI, Pittsburgh Sleep Quality Index.

et al., 2015; Otte et al., 2010). In addition, they are anxious when experiencing sleep disorders, such as difficulty in falling asleep due to vasomotor symptoms such as hot flashes or night sweats (Vincent et al., 2014). Such anxieties persist in symptoms and signs such as lack of energy, loss of interest, unhappy mood and depressed mood, and thus, anxiety and depression need to be managed together.

The results of this study found that sleep duration and sleep disturbance were factors affecting anxiety. This is in line with the results of a study revealing that insomnia in breast cancer survivors was associated with anxiety (Akechi et al., 2015). Because breast cancer survivors who have low satisfaction with sleep may be more anxious about the possible negative effects of sleep on their health, intervention programmes to improve sleep quality are needed.

In this study, the score for the level of depression in breast cancer survivors was 6.60 out of 21 points and 15.8% had moderate depression with more than 11 points, indicating that the level of depression was lower than that (9.20 points) in female cancer patients (Seok & Jun, 2016), the proportion of those with moderate depression was lower than that (35.1%) in female cancer patients (Seok & Jun, 2016), and the level of depression was higher than that (4.1 points) in cancer survivors aged 25–55 years (Inhestern et al., 2017).

This study showed that in breast cancer survivors, depression was high in those without a job compared with those with a job, like the results of a study by Inhestern et al. (2017). This is presumed to be because people with a job are more likely to have more social relations and physical activity than those without a job and become less depressed when they are able to identify their presence or value through their job, to mature and to live a thankful life (Bae & Kwon, 2016).

Previous studies have reported that physical activity or exercise intervention correlated between depression and fatigue in breast cancer survivors (Galiano-Castillo et al., 2014). Because the amount of physical activity was not investigated in this study, further studies are needed in this area in future In addition, one previous study reported that there was a relationship between fatigue and depression (Galiano-Castillo et al., 2014), but this study did not consider the degree of depression due to fatigue.

The results of this study showed that the levels of anxiety and depression were higher in those who had undergone their surgery less than 60 months (5 years) previously, than in those in whom more than 121 months (10 years) had elapsed since surgery. This was similar to the results of a study showing that levels of anxiety and depression were highest in breast cancer survivors with a duration since diagnosis of 2–4 years (Inhestern et al., 2017). Within 5 years after diagnosis, patients experience the sequelae of treatment and may develop cancer metastasis and recurrence; thus, the level of depression in these breast cancer survivors was high (Galiano-Castillo et al., 2014). This is thought to be because cancer patients are highly anxious about the possible recurrence of cancer (Akechi et al., 2015), while receiving regular screening after treatment and living as healthy people.

The results of this study showed that the levels of anxiety and depression were high in breast cancer survivors currently receiving hormone therapy, and the level of depression was high in those who previously received chemotherapy or radiotherapy. Cancer-related therapies that breast cancer survivors were currently receiving were a risk factor for anxiety and depression (Beatty & Kissane, 2017). Breast cancer survivors are presumed to experience an increasing level of depression, as they encounter side effects such as early menopause and menopausal symptoms while undergoing surgery and adjuvant therapy (Palmer et al., 2016).

Therefore, it is necessary to provide interventions to relieve depression in breast cancer survivors who experience early menopause or menopausal symptoms. Further studies are needed to investigate the relationship between early menopause or menopausal symptoms and depression.

In this study, factors affecting depression were found to include sleep latency and subjective sleep quality. This finding was similar to the results of previous studies, where there were correlations between sleep latency and depression and between subjective sleep quality, sleep duration and depressive symptoms in breast cancer survivors (Budhrani et al., 2015; Carpenter et al., 2004). In addition, because cancer patients with sleep-arousal disorders frequently experience depression (Clark et al., 2004), it is presumed that depression and sleep disorders interact with each other. Therefore, further studies are needed to identify the causal relationship between depression and sleep quality (sleep latency and subjective sleep quality) in breast cancer survivors.

The results of this study showed that sleep quality factors commonly affecting anxiety and depression included daytime dysfunction and feeling refreshed when waking up in the morning. As cancer patients may experience difficulty in falling asleep (even after the end of treatment) or difficulty in maintaining sleep, they experience reduced sleep efficiency and symptoms such as excessive daytime sleepiness due waking up early, for several years (Roscoe et al., 2007).

The management of sleep quality is important for relieving anxiety and depression, because cancer patients who cannot do what they want due to low sleep quality become depressed and anxious, due to the fear that their sleep quality may have a negative impact on their health (Akechi et al., 2015; Clark et al., 2004).

Alfano et al. (2011) reported that 77.0% of breast cancer survivors were under- or over-sleeping 30 months after treatment. Such changes in sleep duration led to fatigue and lowered quality of life and sleeping disorders, and symptoms such as anxiety and depression are often accompanied by fatigue (Fiorentino et al., 2011). Therefore, sleep management is necessary to manage anxiety and depression in breast cancer survivors (Vincent et al., 2014) and it is imperative to develop programmes to improve sleep quality.

However, the results of this study are significant in that the sleep quality factors (daytime dysfunction and feeling refreshed when waking up in the morning, sleep duration, sleep disturbance, sleep latency and subjective sleep quality) were the major variables affecting anxiety and depression in breast cancer survivors.

4.1 | Limitations

Firstly, the samples of this study were selected using convenience sampling from among breast cancer survivors who participated in breast cancer self-help groups, and it is difficult to generalize the results. Secondly, this study assessed that differences in sleep quality and anxiety and depression according to the use of combination therapy in breast cancer survivors were not investigated.

Thirdly, this study did not analyse the difference between sleep quality, anxiety and depression according to the level of fatigue experienced by breast cancer survivors. Finally, since this study is a cross-sectional survey study using questionnaires, there is a limitation in not being able to identify the causal relationship between related variables.

5 | CONCLUSION

In this study, we found that the factors commonly affecting anxiety and depression were daytime dysfunction and feeling refreshed when waking up in the morning. Sleep duration and sleep disturbance were found to affect anxiety, and sleep latency and subjective sleep quality were found to affect depression. These results suggest that various factors affecting sleep quality should be considered when providing nursing care for anxiety and depression in breast cancer survivors.

This author suggests conducting a follow-up study that identifies the effects of sleep quality, measured by quantitative tools such as polysomnography and hormone tests, on anxiety or depression. It is also necessary to conduct a longitudinal study that identifies changes in anxiety, depression or sleep disorders over the survival period.

CONFLICT OF INTEREST
The authors declared no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

AUTHOR CONTRIBUTIONS
O. Cho and K. Hwang contributed to the conception, design, data collection, analysis and interpretation of data, writing and revising the manuscript critically were undertaken.

DATA AVAILABILITY STATEMENT
No data available online. All supporting data can be provided upon request to the authors.

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