Sleep Quality and Associated Factors Among Survivors of Breast Cancer: From Diagnosis to One Year Postdiagnosis

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OBJECTIVES: To examine sleep quality and self-reported causes of sleep disturbance among patients with breast cancer at diagnosis and one year later.

SAMPLE & SETTING: 486 of 606 patients with histologically confirmed breast cancer completed a Pittsburgh Quality Sleep Index (PSQI) survey at the time of diagnosis and again one year later.

METHODS & VARIABLES: In this secondary data analysis, descriptive statistics were computed for seven PSQI components and its global score. Wilcoxon signed-rank tests and McNemar's tests were used. Self-reported reasons for sleep disturbances were summarized.

RESULTS: PSQI scores significantly increased from baseline ($\bar{X}$ = 6.75) to one-year follow-up ($\bar{X}$ = 7.12), indicating worsened sleep. Sleep disturbance and onset latency scores increased, whereas sleep efficiency decreased. The two most frequently reported reasons for sleep disturbance were waking up late in the night or early in the morning (more than 50%) and needing to use the bathroom (49%). Feeling too hot and experiencing pain three or more times per week were reported by participants at baseline and one year later.

IMPLICATIONS FOR NURSING: Results can aid in monitoring patient response to treatment methods and formulating benchmarks to manage sleep problems.

KEYWORDS insomnia; breast cancer survivors; sleep quality

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Breast cancer is the most common form of cancer in women worldwide (Siegel et al., 2024), with about 2.3 million newly diagnosed cases in 2020, representing 11.7% of all cancer diagnoses (Sung et al., 2021). The American Cancer Society (2024) estimates that in 2024 there will be 310,720 new cases and 42,250 deaths from invasive breast cancer in women. According to Cheng et al. (2017), such a large number of breast cancer diagnoses, in addition to significantly improved survival rates, resulted in a surge of breast cancer survivors (BCSs) whose health needs warrant attention but are often ignored.

Quality sleep, defined as an individual's self-satisfaction with all aspects of the sleep experience (Buysse et al., 1989), is crucial for overall well-being and affects cognitive function and various aspects of health (Ramar et al., 2021). This prevalence is alarming because poor sleep quality is associated with increased risk of mortality, cardiovascular disease, diabetes, obesity, and cancer (Ramar et al., 2021).

Based on a systematic review and meta-analysis by Leysen et al. (2019), the prevalence of sleep disturbance, mainly defined as insomnia and/or sleep–wake disturbance, is about 40% among BCSs. Studies using validated questionnaires, such as the Pittsburgh Sleep Quality Index (PSQI) or the Insomnia Severity Index, suggest that the prevalence of poor sleep ranges from 38% to 66% (Gonzalez & Lu, 2018; Lowery-Allison et al., 2018; Otte et al., 2010; Reinsel et al., 2015). The prevalence of clinically significant moderate to severe insomnia among BCSs ranges from 18% to 46% (Bao et al., 2016; Desai et al., 2013; Taylor et al., 2012).

Addressing poor sleep quality among BCSs is vital because it correlates with diminished quality of life, impaired performance, and adverse health outcomes (Lowery-Allison et al., 2018). Although previous studies emphasized single aspects of sleep

or employed varied assessment instruments, comprehensive longitudinal studies spanning from diagnosis to post-treatment are scarce. Focusing on this period is crucial for preventing and mitigating severe sleep disturbances and their potential long-term health consequences in patients with breast cancer (Fiorentino & Ancoli-Israel, 2006). To comprehensively understand changes in the sleep quality of patients with breast cancer from diagnosis to post-treatment, the authors of the current study used the validated PSQI survey to assess multiple aspects of sleep at diagnosis and one year after diagnosis. Detailed reasons for self-reported poor sleep quality were carefully examined.

Methods

Study Population

The study population consisted of women who were recently diagnosed with histologically confirmed early-stage breast cancer (stage 0–IIIa), were treated at Roswell Park Comprehensive Cancer Center in Buffalo, New York, were enrolled in Roswell Park's Data Bank and BioRepository (Ambrosone et al., 2006), and participated in the Women's Health After Breast Cancer (ABC) Study (Cheng et al., 2016). The ABC Study recruited 913 patients with nonmetastatic early-stage (0–IIIa) breast cancer between March 1, 2006, and February 3, 2016, to examine determinants of weight gain after diagnosis. For the current study, participants included 606 women who completed the PSQI survey at the time of diagnosis as a supplementary questionnaire added to the ABC Study. However, the authors included only participants with baseline and one-year follow-up data (N = 486). In this study, 466 participants and 485 participants had sleep data at diagnosis and one year later, respectively, depending on the sleep variable assessed.

This research was approved by the institutional review board at Roswell Park Comprehensive Cancer Center. Confidentiality of patient information and data protection was assured.

Questionnaires

Participants completed self-administered surveys at diagnosis and one year later. These surveys collected information on demographic, lifestyle, and epidemiologic risk factors for breast cancer. The ABC Study questionnaires used validated instruments to assess symptoms experienced by patients with breast cancer and their health-related quality of life (Cheng et al., 2016). Sleep data were collected via the PSQI, which is widely used to assess sleep quality and impairment in diverse populations (Rogers et al., 2017). The PSQI has a scoring test–retest reliability of 0.87 and excellent validity (Backhaus et al., 2002). The survey contains 19 items and uses a Likert-type scale ranging from 0 (least dysfunction) to 3 (greatest dysfunction) to assess the following seven sleep areas: subjective sleep quality, sleep latency (i.e., how many minutes it takes to fall asleep), sleep duration, habitual sleep efficiency (i.e., the percentage of time in bed that one is asleep), sleep disturbances, use of sleep medication, and daytime dysfunction during the past month. Good sleep quality in adults includes a sleep onset latency of 30 minutes or less, sleep duration between seven and nine hours, and a sleep efficiency of 85% or greater (Hirshkowitz et al., 2015; Ohayon et al., 2017). The seven scores are summed to generate a global score, ranging from 0 to 21, with higher scores indicating worse sleep quality (Fabbri et al., 2021). Numerous studies have proposed that a score of 5 or lower is indicative of satisfactory sleep, whereas a total score equal to or greater than 5 suggests the presence of some level of insomnia (Leysen et al., 2019). It has been proposed that using a cutoff score greater than 6 enhances the specificity in identifying primary insomnia (Backhaus et al., 2002; Reinsel et al., 2015), and a cutoff score of 8 has been suggested for patients with cancer (Carpenter & Andrykowski, 1998). Carpenter and Andrykowski (1998) used a PSQI cutoff score of greater than 8 within a cohort of 102 women undergoing routine follow-up care for breast cancer. The findings led Carpenter and Andrykowski (1998) to suggest that a cutoff score exceeding 8 may be more suitable for identifying poor sleep within clinical populations, which was also suggested by Beck et al. (2004). The current study's authors examined using cutoff scores of 5 and 8 in the analyses, as suggested by evidence from Carpenter and Andrykowski (1998).

Data Cleaning and Analysis

The rate of missing data for individual questions in the PSQI was 0.3% (n = 2 of 606) in the baseline questionnaire, and about 22% (n = 131) to 23% (n = 140) for the one-year follow-up questionnaire (see Supplementary Tables 1–3 online for additional sleep data, patient characteristics, and clinical data). When possible, descriptive comments from the participant or internal logic between questions were used to infer missing data. In this study, only those who had baseline and one-year follow-up data (N = 486) were included. After data cleaning, 466 participants and 485 participants had sleep data at diagnosis and one year later, respectively, depending on their responses to the PSQI.

Demographic and clinical characteristics were summarized for the overall sample and by global PSQI

scores at diagnosis using cutoff scores of 5 and 8. The mean, SD, and range were provided for continuous variables and analyzed using Wilcoxon rank-sum test. Frequencies were provided for categorical variables; nominal categorical variables were analyzed using the Pearson's chi-square test, and ordinal categorical variables were analyzed using the Wilcoxon rank-sum test.

TABLE 1. Patient Demographics at Baseline

	Total (N = 486)			PSQI Score of 5 or Less (N = 188)			PSQI Score Greater Than 5 (N = 288)			
Characteristic	**$\bar{X}$**	**SD**	**Range**	**$\bar{X}$**	**SD**	**Range**	**$\bar{X}$**	**SD**	**Range**	**p**
Age at diagnosis (years)	56.4	10.5	27–84	57.6	10.3	32–78	55.5	10.5	27–84	0.014
Body mass index (kg/m^2)	29.3	6.9	17–60	29.3	7.4	17–53	29.9	8.7	18–60	0.697
Characteristic		**n**	**%**		**n**	**%**		**n**	**%**	**p**
Age at diagnosis (years)										0.216
Younger than 50		130	27		42	22		86	30	
50 or older		356	73		146	78		202	70	
Body mass index (kg/m^2)										0.344
Less than 18.5		1	< 1		–	–		1	< 1	
18.5–24		151	31		65	35		82	28	
25–30		126	27		48	26		76	26	
Greater than 30		181	37		68	36		109	39	
Missing data		27	6		7	4		20	7	
Education										0.668
Grade school or some high school		7	1		–	–		7	2	
High school graduate or GED		101	21		44	23		57	20	
Some college		155	32		56	30		94	33	
College graduate (4 years)		105	22		44	23		59	20	
Advanced degree		96	20		38	20		55	19	
Missing data		22	4		6	3		16	6	
Household income ($)										0.008
Less than 10,000		9	2		–	–		9	3	
10,000–24,999		54	11		14	7		38	13	
25,00–49,999		102	21		40	21		59	20	
50,00–74,999		98	20		41	22		55	19	
75,000 or more		155	32		70	37		83	29	
Missing data		68	14		23	12		44	15	
Race										0.085
Black		15	3		2	1		13	5	
White		437	90		176	94		251	87	
Other		12	2		4	2		8	3	
Missing data		22	5		6	3		16	6	

PSQI—Pittsburgh Sleep Quality Index
Note. Because of rounding, percentages may not total 100.
Note. Wilcoxon rank-sum test was used to compare numeric variables or ordinal categorical variables between the PSQI groups, and Pearson's chi-square test was used to compare nominal categorical variables between the PSQI groups.

To compare changes in sleep parameters from the time of breast cancer diagnosis to one year later, Wilcoxon signed-rank tests were used for ordinal categorical sleep variables. All statistical significance tests were two-sided, and a p value of 0.05 or less was considered statistically significant. To further examine underlying problems that cause sleep disturbance, potential answers were summarized for the following multiple-choice question: "During the past month, how often have you had trouble sleeping because you (a) cannot get to sleep within 30 minutes, (b) wake up in the middle of the night or early morning, (c) have to get up to use the bathroom, (d) cannot breathe comfortably, (e) cough or snore loudly, (f) feel too cold, (g) feel too hot, (h) had bad dreams, (i) have pain, [or] (j) other reasons?" All statistical analyses were performed using IBM SPSS Statistics, version 27.0.

Results

Participant Characteristics

The age at diagnosis for all women who had completed baseline and one-year follow-up surveys (N = 486)

TABLE 2. Patient Clinical Demographics at Baseline

	Total (N = 486)		PSQI Score of 5 or Less (N = 188)		PSQI Score Greater Than 5 (N = 288)		
Characteristic	**n**	**%**	**n**	**%**	**n**	**%**	**p**
Cancer grade							0.351
Well differentiated	118	24	51	27	63	22	
Moderately differentiated	187	38	67	36	117	41	
Poorly differentiated	123	25	49	26	73	25	
Undifferentiated or anaplastic	1	< 1	–	–	1	< 1	
Missing data	57	12	21	11	34	12	
Cancer stage							0.351
0	80	17	29	15	48	17	
I	256	53	97	52	154	53	
II	112	23	43	23	68	24	
III	30	6	15	8	14	5	
IV	5	1	3	2	2	< 1	
Missing data	3	< 1	1	< 1	2	< 1	
Estrogen receptor status							0.335
Positive	383	79	153	81	223	77	
Negative	90	19	33	18	55	19	
Missing data	13	3	2	1	10	3	
Chemotherapy							0.297
No	300	62	119	63	174	60	
Yes	186	38	69	37	114	40	
Hormone therapy							0.267
Yes	363	75	144	77	212	74	
No	123	25	44	23	76	26	
Radiation therapy							0.304
Yes	352	72	140	74	207	72	
No	134	28	48	26	81	28	

PSQI—Pittsburgh Sleep Quality Index
Note. Because of rounding, percentages may not total 100.
Note. Wilcoxon rank-sum test was used to compare numeric variables or ordinal categorical variables between the PSQI groups, and Pearson's chi-square test was used to compare nominal categorical variables between the PSQI groups.

TABLE 3. Sleep Aspects at Baseline and 1-Year Follow-Up (N = 486)

	Baseline		1-Year Follow-Up		
Characteristic	**$\bar{X}$**	**SD**	**$\bar{X}$**	**SD**	**p**
PSQI score	6.75	3.91	7.12	4.03	0.019
Characteristic	**n**	**%**	**n**	**%**	**p**
Sleep duration score (hours) (N = 475)					0.435
Less than 5	34	7	28	6	
Between 5 and 6	54	11	60	13	
Between 6 and 7	135	28	126	27	
7 or more	252	53	261	55	
Sleep disturbance (N = 481)					0.0001***
None during the past month	11	2	18	4	
Less than once per week	327	68	264	55	
Once or twice per week	133	28	184	38	
3 or more times per week	10	2	15	3	
Sleep efficiency (%) (N = 472)					0.045*
Less than 65	54	11	50	11	
65–74	48	10	66	14	
75–84	101	21	125	26	
85 or greater	269	57	231	49	
Sleep onset latency[a] (N = 475)					0.006**
Not during the past month	127	27	121	25	
Less than once per week	212	45	195	41	
Once or twice per week	87	18	84	18	
3 or more times per week	49	10	75	16	
Sleep onset latency time (minutes) (N = 474)					0.003**
0–15	258	54	241	51	
16–30	152	32	146	31	
31–60	53	11	67	14	
More than 60	11	2	20	4	
Daytime dysfunction caused by tiredness (N = 483)					0.152
Not during the past month	171	35	196	41	
Less than once per week	216	45	193	40	
Once or twice per week	83	17	81	17	
3 or more times per week	13	3	13	3	
Sleep medicine use (N = 485)					0.116
Not during the past month	336	69	330	68	
Less than once per week	47	10	44	9	
Once or twice per week	33	7	21	4	
3 or more times per week	69	14	90	19	
Subjective sleep quality (N = 484)					0.204
Very good	79	16	73	15	
Fairly good	96	20	100	21	
Uncertain	203	42	186	38	

Continued on the next page

TABLE 3. Sleep Aspects at Baseline and 1-Year Follow-Up (N = 486) *(Continued)*

Characteristic	Baseline n	Baseline %	1-Year Follow-Up n	1-Year Follow-Up %	p
Subjective sleep quality (N = 484) *(continued)*					0.204
Fairly poor	90	19	104	21	
Very bad	16	3	21	4	
PSQI cutoff score of 5 (N = 466)					0.127
Greater than 5 (poor sleep)	280	60	298	64	
0–5 (good sleep)	186	40	168	36	
PSQI cutoff score of 8[b] (N = 466)					0.111
Greater than 8 (poor sleep)	145	31	163	35	
0–8 (good sleep)	321	69	303	65	

* $p \leq 0.05$
** $p \leq 0.01$
*** $p \leq 0.001$
[a] Defined as taking longer than 30 minutes to fall asleep
[b] McNemar's test was used to analyze nominal categorical variables.
PSQI—Pittsburgh Sleep Quality Index
Note. Because of rounding, percentages may not total 100.
Note. N values differ in each category because of missing data.
Note. Sleep efficiency scores are calculated by dividing the number of hours slept by the number of hours spent in bed and multiplying the total by 100.

ranged from 27 to 84 years, with a mean age of 56.4 years (SD = 10.5) (see Table 1). The study population was predominantly White (90%), 32% had some college education, 22% were college graduates, and 20% had an advanced degree. About 32% had a household income of at least $75,000. In addition, almost all participants had stage 0–III breast cancer, 38% of participants had moderately differentiated tumors, and 79% were diagnosed with estrogen receptor–positive cancer. Most research participants received radiation therapy (72%) and hormone therapy (75%), and 38% received chemotherapy (see Table 2).

In comparison to participants with a PSQI score of 5 or less, those who had a PSQI score greater than 5 indicated some degree of insomnia (N = 288). This group's ages ranged from 27 to 84 years ($\bar{X}$ = 55.5 years, SD = 10.5, p = 0.014), and they had a lower average income (p = 0.008). No differences were observed by body mass index (BMI), level of education attained, race, breast cancer characteristics, or breast cancer treatments received. BMI was analyzed with and without outliers, and no changes were noticed. In addition, the Wilcoxon rank-sum test was used to compare BMI between the two PSQI groups (5 or less, or greater than 5), which can account for outliers.

When comparing participants with PSQI scores of 8 or less to those with PSQI scores greater than 8 (n = 329) whose ages ranged from 27 to 84 years ($\bar{X}$ = 55.6, SD = 10.8), there was a statistically significant difference in household income (p = 0.001). However, no differences were noticed by age, BMI, level of education attained, race, breast cancer characteristics, or breast cancer treatments received.

In addition, a comparison of baseline characteristics between patients with complete follow-up data and those with missing follow-up data was conducted. A statistically significant difference in lower household income was observed between the two groups (p = 0.007).

Changes in Sleep Patterns From Diagnosis to One Year Postdiagnosis

When evaluating sleep disturbance subscale scores (N = 481), 28% of participants reported sleep disturbances at least once or twice per week at diagnosis, which increased to 38% of participants one year later (see Table 3). In addition, 2% of participants reported sleep disturbances three or more times per week at diagnosis, which increased to 3% one year later (p = 0.0001). Sleep onset latency scores (N = 475, p = 0.006), sleep onset latency times (N = 474, p = 0.003),

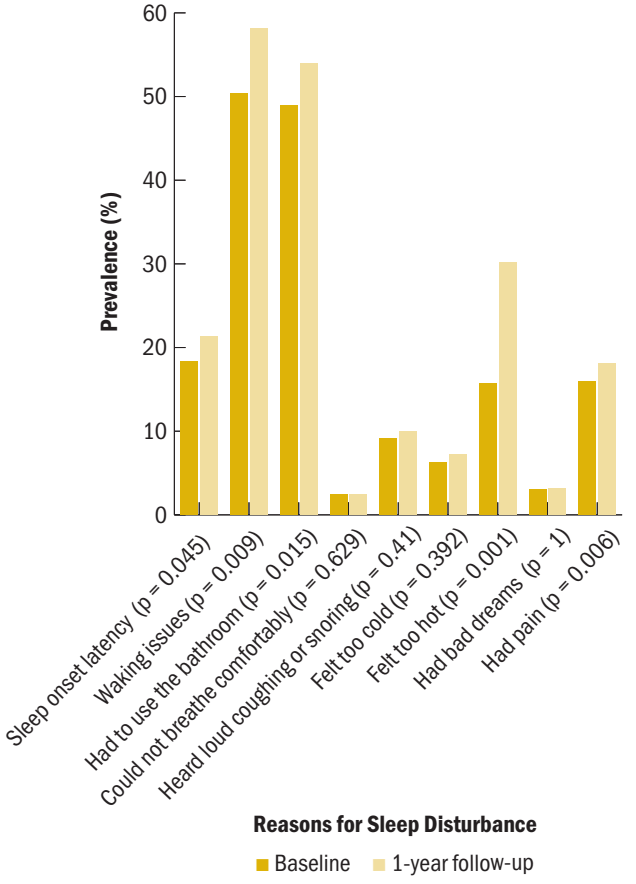
and sleep efficiency (N = 472, p = 0.045) scores worsened during this time period. At diagnosis, about 57% of patients had a sleep efficiency of 85% or greater, whereas only 49% of patients reported a sleep efficiency of 85% or greater one year after diagnosis. Sleep efficiency was calculated by dividing the number of hours slept by the number of hours spent in bed and multiplying the total by 100. There was no significant difference in scores of sleep duration, daytime dysfunction, use of sleep medicine, and sleep quality. Overall PSQI scores significantly increased from $\bar{X}$ = 6.75 at diagnosis to $\bar{X}$ = 7.12 one year later (p = 0.019).

Self-Reported Reasons for Sleep Problems

Self-reported reasons for having sleep disturbances three or more times per week at diagnosis and one year postdiagnosis are represented in Figure 1. About 18% (n = 86) of participants at baseline and 21% (n = 101) of participants at one-year follow-up reported that they could not fall asleep within 30 minutes three times or more per week (p = 0.045). In addition, 50% (n = 288) of participants at diagnosis and 58% (n = 282) of participants at one-year follow-up reported that they woke up in the middle of the night or early morning three or more times per week (p = 0.009). About 49% of participants at diagnosis and 54% of participants at one-year follow-up reported that they woke up to use the bathroom three or more times per week (p = 0.015). In addition, sleep disturbances caused by being too hot were reported by 16% (n = 76) of participants at baseline and increased substantially to 30% (n = 146) of participants one year later (p = 0.001). About 16% (n = 77) of participants reported having pain that woke them up or kept them from falling asleep three or more times per week at baseline, and 18% (n = 87) of participants reported the same at one-year follow-up (p = 0.006).

Figure 2 summarizes reported reasons for sleep loss, which included worry and concern, having a partner or spouse who snored, experiencing pain, existing sleep disorders, persistent environmental factors (e.g., noise, light, having pets), and behavioral factors such as caffeine ingestion, eating habits (e.g., eating too late), and going to bed too late. Sleep disturbances because of worry and concern were reported more often than any other reasons at the time of diagnosis. Of 160 baseline responses, 43 participants (27%) reported worry and concern, compared to 17 (14%) of 121 responses at one-year follow-up. Another frequently reported reason for sleep disturbance was pain, which made up 20% of baseline responses and 28% of one-year follow-up responses. In addition, 13% (n = 20) of responses at baseline and 11% (n = 13) of responses at one-year follow-up reported disturbed sleep because of a bed partner. Existing sleep disorders, such as restless leg syndrome and insomnia, were reported as another reason for sleep disturbance and made up 13% (n = 20) of responses at baseline and 16% (n = 19) of responses at one-year follow-up. Of other reasons reported, which accounted for 11% of all reported reasons, environmental factors (e.g., noise, watching television, lights, room temperature) were often cited as other reasons for sleep disturbances by

FIGURE 1. Reasons for Sleep Disturbance 3 or More Times Per Week (N = 486)



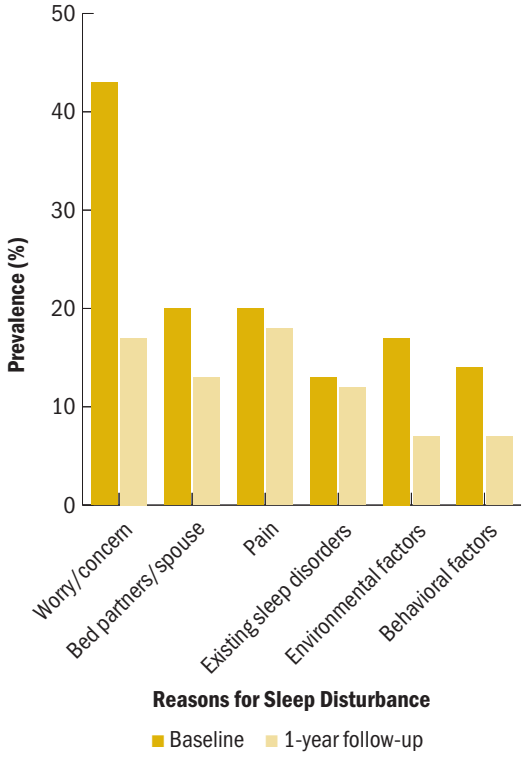
Note. Reasons were multiple-choice options to question 7 on the Pittsburgh Sleep Quality Index, which asks "During the past month, how often have you had trouble sleeping because you . . .?"
Note. McNemar's test was used to analyze binary variables.
Note. Sleep onset latency problems are defined as taking longer than 30 minutes to fall asleep.
Note. Waking issues included waking too late in the night or too early in the morning.

17% (n = 27) of patients at baseline, compared to 7% (n = 8) of patients at one-year follow-up. Some behavioral factors like sleeping habits, diet, and caffeine ingestion also affected the sleep of 14% (n = 22) of patients at baseline, compared to 7% (n = 8) of patients at one-year follow-up.

Discussion

The study findings show that sleep quality is a persistently problematic issue for patients with breast cancer who reported having poor sleep. In this study, poorer sleep quality was associated with younger participants based on a PSQI cutoff score of 5. These findings are consistent with other study findings that younger age is associated with significant sleep disturbance (Berger et al., 2019).

FIGURE 2. Most Reported "Other" Reasons for Sleep Disturbance 3 or More Times Per Week (N = 486)



Note. Based on the response to the question 5j on the Pittsburgh Sleep Quality Index, which lists environmental factors such as noise, light, and having pets, as well as behavioral factors like caffeine ingestion, eating late, and going to bed too late.
Note. There were 160 baseline responses and 121 responses at 1-year follow-up.

In addition to the PSQI score, multiple sleep components of the PSQI worsened at one-year follow-up compared to baseline, including sleep latency, disturbance, and efficiency. The most frequently reported reasons for disturbed sleep at one-year follow-up included not being able to fall asleep within 30 minutes, waking in the middle of the night or early morning, feeling too hot, and having pain. Among the responses on the PSQI regarding "other reasons" for sleep disturbance, the majority of participants reported that worry and concern were common problems.

The current study found that most participants experienced poor global sleep quality at baseline, which persisted and often modestly worsened during the first year based on global PSQI scores. These results are consistent with previous studies in which higher levels of sleep disturbance have been persistent in women with breast cancer (Bower et al., 2011; Costa et al., 2014; Van Onselen et al., 2013). These findings showed that sleep disturbances are a problematic issue at diagnosis and one-year follow-up, similar to findings from studies conducted by Otte et al. (2016), Lowery-Allison et al. (2018), and Reinsel et al. (2015) that measured sleep disturbance using the PSQI. The results of the current study are in concordance with previous studies in which poor sleep quality and disturbance are a reality that many patients with breast cancer experience (Dahl et al., 2011; Kim et al., 2008; Klyushnenkova et al., 2015; Otte et al., 2010).

Poor sleep quality has been previously linked to environmental disturbances (e.g., room temperature, noise), and physiologic (e.g., hot flashes, pain) and psychological (e.g., worry, anxiety) factors among BCSs (Leysen et al., 2019). Similar to previous reports (Dahl et al., 2011; Desai et al., 2013), the current study also revealed that feeling overheated and experiencing pain were commonly reported reasons leading to sleep disturbances, particularly one year after diagnosis; these are likely potential side effects from breast cancer treatments (e.g., hormone therapy). Management of hot flashes and pain may be needed for BCSs to improve their sleep quality.

Psychological distress including worry and anxiety has been associated with poor sleep quality among patients with breast cancer (Tsaras et al., 2018). The current study's findings indicate that about 27% (N = 160) of participants at diagnosis and 14% (N = 121) of participants one year later experienced worry and anxiety to a degree that affected their sleep based on their narrative responses to question 5j (regarding other reasons for sleep disturbance) on the PSQI.

It has been reported that BCSs can experience distress related to cancer or fear of cancer recurrence (Bleiker et al., 2000; Cappiello et al., 2007). The prevalence of worry and anxiety in this study was similar to that in previous studies that used different scales to measure anxiety among patients with breast cancer (Gabra & Hashem, 2021; Hassan et al., 2015; Srivastava et al., 2015; Tsaras et al., 2018).

In addition, sleep disturbances caused by spouses or bed partners were reported in this study. Having a bed partner with disrupted sleep can also contribute to the disrupted sleep experienced by BCSs. These findings were similar to studies by Otte et al. (2010), O'Donnell (2004), and Jefferson et al. (2005). Patients in the current study reported that environmental factors, such as light, noise, sound, and room temperature, affected their sleep quality. These findings were similar to observations by Farokhnezhad Afshar et al. (2016) in that room temperature, lighting, and noise can reduce sleep quality. In addition, some behavioral factors were self-reported, such as diet (e.g., eating late), caffeine consumption, and sleeping habits. According to a study conducted by Sejbuk et al. (2022), there is an increasing amount of evidence indicating that quality of sleep can be substantially influenced by factors such as eating habits and sleep hygiene.

Strengths and Limitations

This study had several limitations. Data collected allow for description of sleep quality and focus on self-reported reasons for sleep disturbance. Another limitation is that this was a secondary data analysis and there is no objective measure of sleep, such as actigraphy or polysomnography. Additional studies are needed to examine other factors related to treatment (e.g., hormone therapy) as risk factors for sleep disturbances. In addition, some participants provided PSQI data only at the time of diagnosis or one year later. Despite the current study's limitations, it longitudinally assessed sleep in patients with breast cancer at the time of diagnosis and at one-year follow-up. This approach allowed the capture of periods encompassing diagnosis and treatment, during which various factors may cause or aggravate sleep disturbances. Therefore, the study addressed a research gap in the literature. With a large sample size and a validated questionnaire such as the PSQI for sleep assessment, this study was more likely to obtain a more realistic picture of poor sleep quality and factors related to sleep disturbances in this population. In addition to sleep quality, the authors also examined multiple sleep components, which is important. For example, by assessing self-reported reasons for poor sleep quality using structured and open-ended questions, clinicians and researchers may be able to assist patients with cancer and cancer survivors to improve their sleep (Hidde et al., 2020).

KNOWLEDGE TRANSLATION

- In breast cancer survivors (BCSs), poor sleep quality persisted over time, as evidenced by Pittsburgh Sleep Quality Index scores.
- Poor sleep quality in BCSs was associated with younger age and psychological distress, as indicated by Pittsburgh Sleep Quality Index scores.
- Efforts should be made to assess and manage sleep disturbance among BCSs, and appropriate referrals should be conducted if needed.

These findings support the need for more research using objective measures of sleep (e.g., actigraphy) to examine sleep among patients with breast cancer from diagnosis through the first few years of survivorship. Through systemic studies, the difference between worsening of preexisting sleep problems caused by specific breast cancer treatments from the onset and into survivorship can be determined (Suni & Singh, 2023).

Implications for Nursing

Findings from this study highlight the importance for oncology nursing practice to recognize that most BCSs and patients with breast cancer experience psychological distress like worry and anxiety (Emre & Yılmaz, 2023), which may promote additional deterioration in sleep quality. Therefore, oncology nurses should screen for these symptoms as well as other symptoms associated with sleep and provide proper support and additional referrals if indicated. In addition, nurses occupy a unique position that allows them to play a pivotal role in educating, developing, and integrating evidence-based practices into the early management of sleep disturbances during cancer treatment.

Conclusion

This study showed that sleep disturbances are common at the time of diagnosis and persist after treatment. In addition to the overall PSQI score, multiple sleep components of the PSQI worsened during the one-year follow-up period from the time of diagnosis, including sleep onset latency, disturbance,

and efficiency, suggesting that cancer diagnosis and treatments may cause or aggravate sleep disturbance. This deserves additional research. The most frequently reported factors that contribute to sleep disturbances include waking up in the middle of the night or early morning, not falling asleep within 30 minutes, having to use the bathroom, feeling too hot, and experiencing pain. Self-reported other reasons included worry and concern, pain, and bed partner– or spouse-related disruptions. These findings will help inform potential prevention and intervention strategies for improving sleep in patients with breast cancer.

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