International Journal of Body, Mind & Culture
Cross-Cultural, Interdisciplinary Health Studies

Sleep Quality and its Associated Factors in Iranian Patients with Breast Cancer

Farzaneh Habibi[1], Marsa Hashemi[2], Simin Hemati[3], Ali Gholamrezaei[4]

[1] Student of Medicine, Medical Students' Research Center, Isfahan University of Medical Sciences, Isfahan, Iran
[2] General Practitioner, Medical Students' Research Center, Isfahan University of Medical Sciences, Isfahan, Iran
[3] Associate Professor, Department of Radiotherapy Oncology, School of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran
[4] General Practitioner, Poursina Hakim Research Institute, Isfahan, Iran

Quantitative Study

Abstract

Background: Sleep disturbances are common, but widely underdiagnosed in cancer patients. Thus, the aim of the present study was to evaluate sleep quality and its associated factors among women with breast cancer.

Methods: This cross-sectional study was conducted on women with breast cancer referring to 2 outpatient clinics in Isfahan, Iran. Sleep quality [Pittsburgh Sleep Quality Index (PSQI)], severity of anxiety and depression [Hospital Anxiety and Depression Scale (HADS)], cancer symptoms [M.D. Anderson Symptom Inventory (MDASI)], and quality of life (QOL) [European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30 (EORTC QLQ-C30)] were assessed in the present study.

Results: The study population consisted of 101 patients with mean age of 49.7 years and mean cancer duration of 2.3 years. The mean global PSQI score of patients was 8.5 and 80.2% had poor sleep quality. Factors associated with global PSQI score in univariate analyses were body mass index (BMI) (r = 0.445), severity of cancer symptoms (r = 0.580), anxiety (r = 0.363), and depression (r = 0.332). BMI and symptom severity were independently associated with poor sleep quality (standardized coefficient = 0.388 and 0.480, respectively). With regards to QOL, patients with poor sleep quality had lower physical and psychosocial functioning than good sleepers.

Conclusion: Sleep disturbances are highly common in women with breast cancer in our society and significantly affect their QOL. Obesity, cancer symptoms, and psychological symptoms are important factors associated with and contributing to sleep problems in these patients. Cancer care programs must have a comprehensive approach, including sleep assessment and management, in the treatment of these patients.

Keywords: Breast cancer, Sleep, Insomnia, Obesity, Anxiety, Depression, Psychosocial, Quality of life

Citation: Habibi F, Hashemi M, Hemati S, Gholamrezaei A. **Sleep Quality and its Associated Factors in Iranian Patients with Breast Cancer.** Int J Body Mind Culture 2016; 3(2): 121-31.

Received: 15 Mar 2016
Accepted: 28 May 2016

Introduction

Sleep disturbances are common, but widely underdiagnosed in cancer patients. Using objective and subjective sleep measures, studies have found sleep disorders in more than half of the patients with cancer (Howell et al., 2014; Sateia & Lang, 2008). Some factors which contribute to sleep disorders in this population include female gender, older age, psychological distress, cancer-related

Corresponding Author:
Ali Gholamrezaei
Email: ali.gholamrezaei@ymail.com

symptoms, and treatment side effects (Howell et al., 2014; Costa et al. 2014; Roscoe et al., 2007). Sleep disturbance is not only an important problem per se, but is also associated with other complaints such as fatigue (Nishiura, Tamura, Nagai, & Matsushima, 2015), anxiety and depression (Die, 2013; Irwin, Olmstead, Ganz, & Haque, 2013), and more frequent physical complaints (Sanford et al., 2013; Fortner, Stepanski, Wang, Kasprowicz, & Durrence, 2002). In general, sleep quality can play an important role in cancer patients' quality of life (QOL) (Liu et al., 2013; Alfano et al., 2011). Breast cancer is the most prevalent type of cancer among Iranian women (Mousavi et al., 2009). The mean age of onset for breast cancer is approximately 15 years younger in Iran in comparison to western countries (Vostakolaei et al., 2012). However, there is a lack of data regarding the prevalence of sleep disorders and their associated factors in Iranian breast cancer patients. Such knowledge is essential for designing comprehensive and supportive care programs for cancer patients in order to improve their QOL (Howell et al., 2014; Redeker, Pigeon, & Boudreau, 2015). Therefore, this study was conducted to assess sleep quality and its associated factors in Iranian patients with breast cancer.

Methods

Patients and Setting

This cross-sectional study was conducted on women with breast cancer referring to two outpatient cancer care clinics in Isfahan (Iran) in 2015. Patients were invited to participate in the study while they were in waiting rooms prior to regular physician appointments. The inclusion criteria consisted of confirmed pathological diagnosis of breast cancer, lack of diagnosis of any other cancer, willingness to participate in the study, and capability of completing the questionnaires either through writing or answering the questions read by the interviewer. Patients who had recently undergone surgery or been hospitalized were not included in the study. Data on the sleep quality of the female population from a general population-based study in Iran were used for comparison (Asghari, Farhadi, Kamrava, Ghalehbaghi, & Nojomi 2012). The study was ethically approved by the board of directors of the Cancer Care Centers and consent to participation was obtained from all patients.

Measures

Demographic data were gathered using a questionnaire and cancer related data were gathered through reviewing the patients' medical records. Other information was collected using the Pittsburgh Sleep Quality Index (PSQI), Hospital Anxiety and Depression Scale (HADS), M.D. Anderson Symptom Inventory (MDASI), and European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30 (EORTC QLQ-C30).

Pittsburgh Sleep Quality Index

The PSQI was used for the assessment of sleep quality. The PSQI consists of 19 items in the 7 scales of overall sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, need meds to sleep, and daytime dysfunction due to sleepiness. The total score of each scale ranges from 0 to 3. The global PSQI score ranges from 0 to 21 with a score of higher than 5 indicating poor sleep quality (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989) and insomnia with high sensitivity and specificity (above 85%) (Backhaus, Junghanns, Broocks, Riemann, & Hohagen, 2002).

Hospital Anxiety and Depression Scale

The HADS was used for the assessment of anxiety and depression. The HADS examines depression and anxiety symptoms with 14 items in 2 subscales each containing 7 items. The total score of each subscale ranges from 0 to 21. The respondents can be categorized as normal (0-7), borderline (8-10), and abnormal cases (11-21) based on their score. With score of 8 and above for each subscale, the HADS has a sensitivity and specificity of approximately 80% in screening anxiety disorders and depression (Bjelland,

Dahl, Haug, & Neckelmann, 2002).

M.D. Anderson Symptom Inventory

The MDASI was used to assess common symptoms in breast cancer patients. The MDASI is an international questionnaire consisting of 13 items which evaluate common core symptoms in patients with various types of cancer (Cleeland et al., 2000). Each item is rated from 0 (not present) to 10 (as bad as you can imagine) and the mean symptom severity is the average of the 13 items.

European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30

The EORTC QLQ-C30 was used in the present study to evaluate QOL. This questionnaire comprises 30 items in 5 functional scales, 9 symptom scales, and a global health status/QOL scale (Aaronson et al., 1993). Because of considerable overlap between symptom scales of the EORTC QLQ-C30 and that of the MDASI, only functional scales were included in the analyses. Each functional scale score ranges from 0 to 100, with high scores representing a high/healthy level of functioning (Aaronson et al., 1993).

The validated Persian versions of all the above-mentioned questionnaires were used in this study (Farrahi Moghaddam, Nakhaee, Sheibani, Garrusi, & Amirkafi, 2012; Montazeri, Vahdaninia, Ebrahimi, & Jarvandi, 2003; Saadatpour et al., 2015; Safaee & Moghim, 2007). A trained interviewer helped the illiterate patients in completing the questionnaires.

Statistical Analysis

The SPSS software (version 16.0, SPSS Inc., Chicago, IL, USA) was used for data analysis. Descriptive data are presented as mean and standard deviation (SD) or number and percentage. Chi-square test was used to compare qualitative variables and independent sample t-test (or Mann-Whitney U test for non-parametric data) was used to compare quantitative variables. The Pearson correlation coefficient (or Spearman's correlation coefficient for non-parametric data) was used to investigate the association between quantitative variables. Linear regression analysis was conducted for the assessment of independent association between various factors and sleep quality. P values of less than 0.05 were considered statistically significant in all analyses.

Results

Patients and cancer characteristics

During the study period, a total of 113 eligible patients were invited to participate. Among them, 5 patients were not willing to participate in the study and data on 7 other patients were not complete, and thus, could not be included in the analyses. Finally, data on 101 patients were included in the analyses. The mean age of the participants was 49.7 ± 11.8 years and 78.4% of the subjects were married. The patients' Education level ranged from primary school (26.7%) to university education level (13.0%), and 12.9% of subjects were illiterate. Only 28.7% had regular physical activity. Their mean body mass index (BMI) was 27.5 ± 4.4 kg/m^2; 24.6% were obese and 50.9% were overweight. The subjects' mean cancer duration was 2.3 years (median = 1 year; ranged from less than 1 year to 19 years). Tumor grades of I, II, and III were present in 12.3%, 54.8%, and 32.9% of the patients, respectively, and 24.2% had metastasis in their cancer history. Regarding cancer treatment history, 31.5% had undergone surgery, 80% had a history of radiotherapy, 86.4% had a history of chemotherapy, and 82.1% were undergoing cancer treatment while participating in the study.

Sleep Quality in cancer patients compared with controls

The mean global PSQI score of the cancer patients was 8.5 ± 4.4, and 80.2% of the patients had poor sleep quality (global score ≥ 5). Based on cancer duration, poor sleep quality was present in 71%, 91.4%, and 77.4% of patients with cancer duration of less than or equal to 1 year, between 1 and 2 years, and 2 years or

more, respectively (P = 0.099). The PSQI dimension scores are presented in figure 1.

Compared to the general female population, cancer patients had higher global PSQI score and higher scores (worse state) in dimensions of duration of sleep, sleep disturbance, sleep efficiency, and the overall sleep quality, particularly in younger age groups (Table 1). Higher score in the need meds to sleep dimension in cancer patients, compared to controls, was only significant in the age group of 50-59 years.

Factors associated with sleep quality in women with breast cancer

***Demographic characteristics*:** Only BMI was correlated with the global PSQI score (r = 0.445, P = 0.001). Regarding the PSQI dimensions, daytime dysfunction due to sleepiness was correlated with age (r = -0.305, P = 0.006), BMI (r = 0.295, P = 0.036), and physical activity (r = -0.245, P = 0.024).

In addition, BMI was correlated with sleep disturbance subscale score (r = 0.390, P = 0.004) and physical activity was correlated with the overall sleep quality subscale score (r = -0.240, P = 0.025).

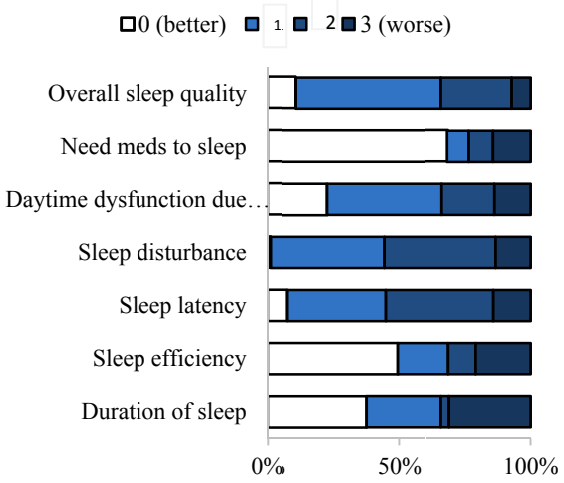

Figure 1. Sleep quality dimensions scores in cancer patients
PSQI: Pittsburgh Sleep Quality Index

Table 1. Pittsburgh Sleep Quality Index global and dimension scores in breast cancer patients compared with general female population categorized by age

	Age (year)			
	30-39	40-49	50-59	60-69
Global PSQI score				
Patients	9.05 ± 5.26*	8.54 ± 4.45†	8.42 ± 4.24†	7.28 ± 4.88
Controls	5.75 ± 3.60	6.27 ± 3.70	6.64 ± 3.93	7.97 ± 4.31
PSQI dimensions				
Duration of sleep				
Patients	1.22 ± 1.47†	1.45 ± 1.26†	1.11 ± 1.18	0.66 ± 1.21
Controls	0.78 ± 0.90	0.92 ± 0.97	1.05 ± 0.97	1.26 ± 1.09
Sleep disturbance				
Patients	1.78 ± 0.85*	1.70 ± 0.65*	1.70 ± 0.77*	1.57 ± 0.53
Controls	1.05 ± 0.48	1.13 ± 0.51	1.23 ± 0.56	1.31 ± 0.59
Sleep latency				
Patients	1.68 ± 0.82	1.68 ± 0.73	1.55 ± 0.93	1.57 ± 1.13
Controls	1.37 ± 1.10	1.49 ± 1.12	1.48 ± 1.10	1.82 ± 1.07
Daytime dysfunction due to sleepiness				
Patients	1.73 ± 1.04†	1.27 ± 0.92	1.23 ± 0.86	1.00 ± 1.15
Controls	1.21 ± 1.05	1.12 ± 1.04	1.07 ± 1.04	1.13 ± 1.06
Sleep efficiency				
Patients	1.00 ± 1.37	1.06 ± 1.12*	1.00 ± 1.24†	1.00 ± 1.26
Controls	0.50 ± 0.94	0.46 ± 0.89	0.60 ± 0.94	0.79 ± 1.11
Overall sleep quality				
Patients	1.42 ± 0.76†	1.36 ± 0.80†	1.22 ± 0.69	0.83 ± 0.75
Controls	0.92 ± 0.76	1.01 ± 0.80	1.03 ± 0.79	1.19 ± 0.86
Need meds to sleep				
Patients	0.31 ± 0.82	0.70 ± 1.20	0.96 ± 1.22†	1.00 ± 1.41
Controls	0.23 ± 0.71	0.45 ± 0.99	0.48 ± 1.04	0.82 ± 1.22

Data are presented as mean ± SD; PSQI: Pittsburgh Sleep Quality Index
* compared with age-matched controls; P < 0.001; † compared with age-matched controls; P < 0.050

Table 2. Association of cancer symptoms and psychological symptoms' severity with sleep quality scores

	MDASI Severity	Anxiety	Depression
Global PSQI score	0.580*	0.363*	0.332*
PSQI dimensions			
Duration of sleep	0.269*	0.145	0.247†
Sleep disturbance	0.563*	0.392*	0.223†
Sleep latency	0.281*	0.101	0.121
Daytime dysfunction due to sleepiness	0.579*	0.379*	0.268*
Sleep efficiency	0.306*	0.137	0.169
Overall sleep quality	0.464*	0.248†	0.296*
Need meds to sleep	0.222†	0.234†	0.214†

Data are presented as Pearson or Spearman's correlation coefficients; PSQI: Pittsburgh Sleep Quality Index; MDASI: MD Anderson Symptom Inventory
* P < 0.001; † P < 0.050

***Cancer-related factors*:** No association was found between cancer duration, tumor grade, or treatment history and any of the sleep quality scores. Those with metastasis had unexpectedly lower global PSQI scores (5.8 ± 3.5 vs. 9.4 ± 4.3, P < 0.001). However, after controlling for BMI, having metastasis was no longer associated with the global PSQI score (P = 0.199). Mean symptoms' severity score (4.1 ± 2.0) was correlated with the global PSQI score (Figure 2) and all of its dimensions (r = 0.222-0.580) (Table 2).

Psychological factors: Mean scores of anxiety and depression subscales and the total HADS score were 10.5 ± 3.8, 8.0 ± 3.8, and 18.7 ± 6.9, respectively. This corresponded to abnormal anxiety and depression levels in 48.1% and 21.9% of the patients, respectively. Both anxiety and depression scores were significantly correlated with the global PSQI score (Figure 3) and many of the PSQI dimensions (r = 0.214-0.392) (Table 2).

Independent predictors of sleep quality: Factors associated with the global PSQI score or its dimensions in univariate analyses were inserted into a linear regression model (Table 3). There was a non-significant association between age and the global PSQI score (β = -0.260, P = 0.062). Higher BMI was associated with poor sleep quality (β = 0.388, P = 0.006). Although symptom severity was associated with poor sleep quality (β = 0.480, P = 0.001), psychological factors were no longer associated with the global PSQI score in this regression model (Table 3).

Association of sleep quality with quality of life

Comparison of QOL between patients with good sleep quality and those with poor sleep quality is presented in table 4. Patients with poor sleep quality had lower global health and lower scores in all functional dimensions of QOL.

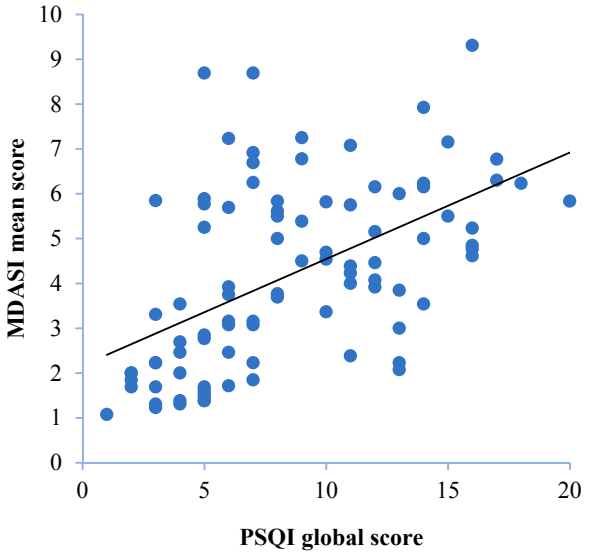

Figure 2. Correlation between symptoms severity and global sleep quality (r = 0.580, P < 0.001).
PSQI: Pittsburgh Sleep Quality Index; MDASI: MD Anderson Symptom Inventory

Table 3. Independent predictors of global sleep quality

	Unstandardized Coefficients	Standardized Coefficients (β)	P-value
Age*	-1.080	-0.260	0.062
BMI*	2.145	0.388	0.006
Physical activity	0.071	0.012	0.932
MDASI severity	0.988	0.480	0.001
Anxiety*	-0.052	-0.010	0.944
Depression*	-0.303	-0.059	0.723

BMI: Body mass index; MDASI: MD Anderson Symptom Inventory; Linear regression model Dependent variable: Pittsburgh Sleep Quality Index global score ; R square = 0.393; * To prevent multicollinearity and for better clinical interpretation, anxiety and depression scores are categorized as normal (0-7), borderline (8-10), and abnormal (11-21), BMI (kg/m^2) is categorized as underweight (< 18.5), normal (18.5-24.9), overweight (25-29.9), and obese (≥ 30), and age is categorized as 30-39, 40-49, 50-59, and 60-69 years.

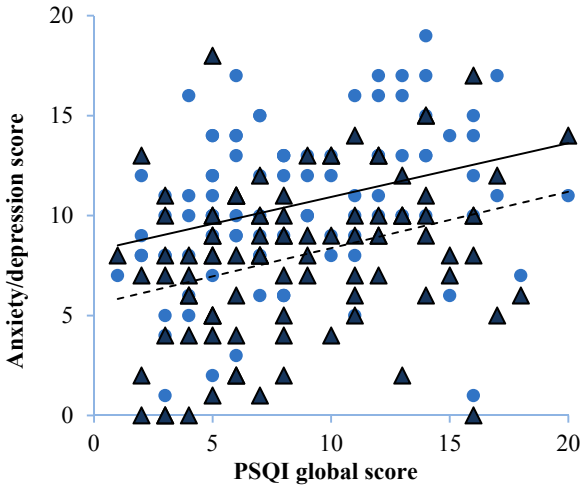

Figure 3. Correlation of anxiety (circle, continuous line) and depression (triangle, dashed line) with global sleep quality (r = 0.363 and 0.332, respectively) (P < 0.001)
PSQI: Pittsburgh Sleep Quality Index

Discussion

Poor sleep quality was found in 80% of the Iranian women with breast cancer which is considerably higher than that in the age-matched general population and significantly associated with impaired physical and psychosocial functioning of the patients. Some similar studies in Iran also showed high frequency of sleep disturbance in these patients (up to 90%) (Khoramirad, Mousavi, Dadkhahtehrani, & Pourmarzi, 2015). Studies in other populations using the same subjective sleep measure (the PSQI) also reported poor sleep quality in 46% to 66% of women with breast cancer (Khoramirad et al., 2015; Sanford et al., 2013; Liu et al., 2013; Ho & Fong, 2014; Chen et al., 2014; Vargas et al., 2010; Colagiuri et al., 2011; Otte, Carpenter, Russell, Bigatti, & Champion, 2010; Beck et al., 2010).

Differences in the frequency of sleep disturbances among various studies may be attributed to differences in demographic characteristics of the studied populations (e.g., age, BMI, and socioeconomic status), cancer-related factors (e.g., cancer duration, symptoms, and treatments), and cut-off scores in the PSQI for defining sleep disturbance. Regardless of these factors, sleep disturbances are common in women with breast cancer throughout their disease course, though contributing factors may be different in various stages.

Table 4. Comparison of quality of life in patients with good and poor sleep quality

Subscales of EORTC QOL-C30	Good sleep quality	Poor sleep quality	P-value
Global health status	70.4 ± 25.5	51.1 ± 21.4	0.002
Physical functioning	70.5 ± 22.6	56.1 ± 24.8	0.015
Role functioning	87.7 ± 24.7	62.0 ± 28.6	< 0.001
Emotional functioning	81.8 ± 14.1	47.3 ± 30.1	< 0.001
Cognitive functioning	91.2 ± 12.8	66.8 ± 27.8	< 0.001
Social functioning	82.4 ± 23.2	66.2 ± 26.3	0.009

EORTC QOL-C30: European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30

Differences were observed between cancer patients and controls in some of the sleep quality dimensions which were more evident in younger age groups; younger patients had more daytime dysfunction due to sleepiness. Similarly, Klyushnenkova, Sorkin, and Gallicchio (2015) found independent association between younger age and excessive daytime sleepiness in a large sample of breast cancer patients. In contrast, Colagiuri et al. (2011) found independent association between older age and poor sleep quality in a large sample of Danish women with breast cancer. The role of age in the association between cancer and sleep disorders is complex. As both breast cancer and sleep disorders are common in middle-aged women (Vostakolaei et al., 2012; Asghari et al., 2012), some patients may already have sleep problems when they are diagnosed with cancer. Although still controversial, there is evidence that sleep disorders may increase the risk of cancer development (Palamaner Subash, Kumar, Cheskin, & Pancholy, 2015). On the other hand, age of onset for breast cancer in Iran is lower than that in western countries (Vostakolaei et al., 2012). Diagnosis of cancer at a younger age and subsequent treatments can have a major impact on patient's daily life, and contribute to poor psychological health and sleep disturbance. A more comprehensive evaluation of age-related factors that can also affect sleep quality (e.g., physical and psychosocial health) in a larger sample of cancer patients as well as longitudinal studies are required in this regard.

Weight gain is a common problem in women with breast cancer early after diagnosis, is unlikely to return to pre-diagnosis state (Makari-Judson, Braun, Jerry, & Mertens, 2014), and is associated with increased mortality (Playdon et al., 2015). The underlying factors are not clear yet, but chemotherapy, menopausal changes, and lifestyle changes (physical inactivity and over eating) may be involved (Goodwin, 2001). In the present study, 75% of the patients had a BMI of above normal range and there was an independent association between BMI and poor sleep quality. In the study by Dhruva et al. (2012), higher BMI was associated with more objective sleep disturbance. Obesity can disturb circadian rhythms in breast cancer patients, leading to poor sleep (Berger, Hertzog, Geary, Fischer, & Farr, 2012). In the general population, obesity is a well-known risk factor for sleep disorders particularly obstructive sleep apnea (Tuomilehto, Seppa, & Uusitupa 2013). The association between obesity and sleep disorders is not however unidirectional. Sleep disturbance can also contribute to obesity and other metabolic problems by affecting neuroendocrine function and glucose metabolism (Beccuti, & Pannain, 2011). In cancer patients, fatigue and psychological distress should also be considered as mediating/moderating factors in the association between obesity and sleep disturbance (Berger et al., 2012; Gerber et al., 2011). Only a small subset of our patients had regular physical activity. Exercise may improve sleep quality not only by decreasing weight, but also by improving other contributing factors such as cancer-related symptoms and psychosocial functioning of the patients (Rogers et al., 2015; Payne, Held, Thorpe, & Shaw, 2008; Tang, Liou, & Lin, 2010; Cheville et al., 2013).

Patients with cancer experience various and debilitating symptoms throughout their disease course such as pain, fatigue, nausea-vomiting, loss of appetite, and dyspnea which may be due to the cancer or treatments (Trajkovic-Vidakovic, de Grae, Voest, & Teunissen, 2012). Pain, fatigue, and sleep disturbance is a common symptom cluster in cancer patients with each symptom aggravating the others (Beck, Dudley, & Barsevick, 2005). Strong and independent association was observed between symptoms and sleep quality. This finding was in agreement with that of Nishiura et al. (2015), Ho and Fong (2014), Yennurajalingam et al. (2015), Ma, Chang, and Lin (2014), and Delgado-Guay, Yennurajalingam, Parsons,

Palmer, and Bruera (2011). There is also interaction between physical and psychological symptoms contributing to sleep disturbance in cancer patients (Ho & Fong, 2014; Colagiuri et al., 2011; Delgado-Guay et al., 2011). Accordingly, sleep problems management in cancer patients requires adequate evaluation, and management of both physical and psychological symptoms. This may be achieved through mind-body interventions and with a biopsychosocial approach for which efficacy studies are needed (Kwekkeboom, Cherwin, Lee, & Wanta, 2010).

The current study had a number of limitations. The study had a cross-sectional design and could not provide information on cause-and-effect relationships. The study sample size was small and included patients were not representative of breast cancer patients in Iran. Other aspects of sleep such as sleep hygiene and beliefs which may have roles in sleep problems in cancer patients were not evaluated (Redeker et al., 2015). Furthermore, a self-report measure of sleep quality was used which could not provide information on the specific underlying sleep disorders. Accordingly, multi-center studies with larger sample of patients in various cancer stages, longitudinal studies, and studies using more objective measures such as polysomnography are required to better understand sleep problems and their underlying factors in cancer patients.

Conclusion

Sleep problems are highly common in women with breast cancer in our society and significantly affect their QOL in various dimensions of physical and psychosocial functioning. Obesity, cancer-related symptoms, and psychological symptoms are important associated/contributing factors in sleep problems among these patients. The present findings may help to inform physicians about sleep disturbance and its associated problems and the need for investigation and management of sleep disturbance. Such management methods in cancer patients require a biopsychosocial approach. Multi-center and longitudinal studies using more objective sleep measures for more accurate investigation of sleep disorders in cancer patients are recommended.

Conflict of Interests

Authors have no conflict of interests.

Acknowledgments

This study had no external funding support. We are thankful to the board of directors of Omid University Hospitals for their cooperation in conducting the study.

References

Aaronson, N. K., Ahmedzai, S., Bergman, B., Bullinger, M., Cull, A., Duez, N. J. et al. (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. *J Natl.Cancer Inst., 85*(5), 365-376. Retrieved from PM:8433390

Alfano, C. M., Lichstein, K. L., Vander Wal, G. S., Smith, A. W., Reeve, B. B., McTiernan, A. et al. (2011). Sleep duration change across breast cancer survivorship: associations with symptoms and health-related quality of life. *Breast Cancer Res Treat., 130*(1), 243-254. doi:10.1007/s10549-011-1530-2 [doi]. Retrieved from PM:21567239

Asghari, A., Farhadi, M., Kamrava, S. K., Ghalehbaghi, B., & Nojomi, M. (2012). Subjective sleep quality in urban population. *Arch.Iran Med, 15*(2), 95-98. doi:0010 [pii];012152/AIM.0010 [doi]. Retrieved from PM:22292580

Backhaus, J., Junghanns, K., Broocks, A., Riemann, D., & Hohagen, F. (2002). Test-retest reliability and validity of the Pittsburgh Sleep Quality Index in primary insomnia. *J Psychosom.Res, 53*(3), 737-740. doi:S0022399902003306 [pii]. Retrieved from PM:12217446

Beccuti, G., & Pannain, S. (2011). Sleep and obesity. *Curr.Opin.Clin Nutr Metab Care, 14*(4), 402-412. doi:10.1097/MCO.0b013e3283479109 [doi];00075197-201107000-00016 [pii]. Retrieved from PM:21659802

Beck, S. L., Dudley, W. N., & Barsevick, A. (2005). Pain, sleep disturbance, and fatigue in patients with cancer: using a mediation model to test a symptom cluster. *Oncol.Nurs Forum, 32*(3), 542. doi:10.1188/04.ONF.E48-E55 [doi]. Retrieved from PM:15897927

Beck, S. L., Berger, A. M., Barsevick, A. M.,

Wong, B., Stewart, K. A., & Dudley, W. N. (2010). Sleep quality after initial chemotherapy for breast cancer. *Support.Care Cancer, 18*(6), 679-689. doi:10.1007/s00520-009-0662-y [doi]. Retrieved from PM:19521723

Berger, A. M., Hertzog, M., Geary, C. R., Fischer, P., & Farr, L. (2012). Circadian rhythms, symptoms, physical functioning, and body mass index in breast cancer survivors. *J Cancer Surviv., 6*(3), 305-314. doi:10.1007/s11764-012-0218-x [doi]. Retrieved from PM:22484807

Bjelland, I., Dahl, A. A., Haug, T. T., & Neckelmann, D. (2002). The validity of the Hospital Anxiety and Depression Scale. An updated literature review. *J Psychosom.Res, 52*(2), 69-77. doi:S0022399901002963 [pii]. Retrieved from PM:11832252

Buysse, D. J., Reynolds, C. F., III, Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry Res, 28*(2), 193-213. doi:0165-1781(89)90047-4 [pii]. Retrieved from PM:2748771

Chen, W. Y., Giobbie-Hurder, A., Gantman, K., Savoie, J., Scheib, R., Parker, L. M. et al. (2014). A randomized, placebo-controlled trial of melatonin on breast cancer survivors: impact on sleep, mood, and hot flashes. *Breast Cancer Res Treat., 145*(2), 381-388. doi:10.1007/s10549-014-2944-4 [doi]. Retrieved from PM:24718775

Cheville, A. L., Kollasch, J., Vandenberg, J., Shen, T., Grothey, A., Gamble, G. et al. (2013). A home-based exercise program to improve function, fatigue, and sleep quality in patients with Stage IV lung and colorectal cancer: a randomized controlled trial. *J Pain Symptom.Manage, 45* (5), 811-821. doi:S0885-3924(12)00328-4 [pii];10.1016/j.jpainsymman.2012.05.006 [doi]. Retrieved from PM:23017624

Cleeland, C. S., Mendoza, T. R., Wang, X. S., Chou, C., Harle, M. T., Morrissey, M. et al. (2000). Assessing symptom distress in cancer patients: the M.D. Anderson Symptom Inventory. *Cancer, 89*(7), 1634-1646. doi:10.1002/1097-0142(20001001)89:7<1634::AID-CNCR29>3.0.CO;2-V [pii]. Retrieved from PM:11013380

Colagiuri, B., Christensen, S., Jensen, A. B., Price, M. A., Butow, P. N., & Zachariae, R. (2011). Prevalence and predictors of sleep difficulty in a national cohort of women with primary breast cancer three to four months postsurgery. *J Pain Symptom.Manage, 42*(5), 710-720. doi:S0885-3924(11)00155-2 [pii];10.1016/j.jpainsymman.2011.02.012 [doi]. Retrieved from PM:21620648

Costa, A. R., Fontes, F., Pereira, S., Goncalves, M., Azevedo, A., & Lunet, N. (2014). Impact of breast cancer treatments on sleep disturbances - A systematic review. *Breast, 23*(6), 697-709. doi:S0960-9776(14)00168-4 [pii];10.1016/j.breast.2014.09.003 [doi]. Retrieved from PM:25307946

Delgado-Guay, M., Yennurajalingam, S., Parsons, H., Palmer, J. L., & Bruera, E. (2011). Association between self-reported sleep disturbance and other symptoms in patients with advanced cancer. *J Pain Symptom.Manage, 41*(5), 819-827. doi:S0885-3924(10)01058-4 [pii];10.1016/j.jpainsymman.2010.07.015 [doi]. Retrieved from PM:21306864

Dhruva, A., Paul, S. M., Cooper, B. A., Lee, K., West, C., Aouizerat, B. E. et al. (2012). A longitudinal study of measures of objective and subjective sleep disturbance in patients with breast cancer before, during, and after radiation therapy. *J Pain Symptom.Manage, 44*(2), 215-228. doi:S0885-3924(12)00140-6 [pii];10.1016/j.jpainsymman.2011.08.010 [doi]. Retrieved from PM:22795049

Die, Trill M. (2013). Anxiety and sleep disorders in cancer patients. *EJC.Suppl, 11*(2), 216-224. doi:10.1016/j.ejcsup.2013.07.009 [doi];S1359-6349(13)00010-4 [pii]. Retrieved from PM:26217130

Farrahi Moghaddam, J., Nakhaee, N., Sheibani, V., Garrusi, B., & Amirkafi, A. (2012). Reliability and validity of the Persian version of the Pittsburgh Sleep Quality Index (PSQI-P). *Sleep Breath., 16*(1), 79-82. doi:10.1007/s11325-010-0478-5 [doi]. Retrieved from PM:21614577

Fortner, B. V., Stepanski, E. J., Wang, S. C., Kasprowicz, S., & Durrence, H. H. (2002). Sleep and quality of life in breast cancer patients. *J Pain Symptom.Manage, 24*(5), 471-480. doi:S0885392402005006 [pii]. Retrieved from PM:12547047

Gerber, L. H., Stout, N., McGarvey, C., Soballe, P., Shieh, C. Y., Diao, G. et al. (2011). Factors predicting clinically significant fatigue in women following treatment for primary breast cancer. *Support.Care Cancer, 19*(10), 1581-1591. doi:10.1007/s00520-010-0986-7 [doi]. Retrieved from PM:20835835

Goodwin, P. J. (2001). Weight gain in early-stage breast cancer: where do we go from here? *J Clin Oncol., 19*(9), 2367-2369. doi:10.1200/jco.2001.19.9.2367 [doi]. Retrieved from PM:11331314

Ho, R. T., & Fong, T. C. (2014). Factor structure of the Chinese version of the Pittsburgh sleep quality index in breast cancer patients. *Sleep Med, 15*(5), 565-569. doi:S1389-9457(14)00069-0 [pii];10.1016/j.sleep.2013.10.019 [doi]. Retrieved from PM:24759325

Howell, D., Oliver, T. K., Keller-Olaman, S., Davidson, J. R., Garland, S., Samuels, C. et al. (2014). Sleep disturbance in adults with cancer: a systematic

review of evidence for best practices in assessment and management for clinical practice. *Ann Oncol., 25*(4), 791-800. doi:mdt506 [pii];10.1093/annonc/mdt506 [doi]. Retrieved from PM:24287882

Irwin, M. R., Olmstead, R. E., Ganz, P. A., & Haque, R. (2013). Sleep disturbance, inflammation and depression risk in cancer survivors. *Brain Behav Immun., 30(Suppl*), S58-S67. doi:S0889-1591(12)00109-2 [pii];10.1016/j.bbi.2012.05.002 [doi]. Retrieved from PM:22634367

Khoramirad, A., Mousavi, M., Dadkhahtehrani, T., & Pourmarzi, D. (2015). Relationship Between Sleep Quality and Spiritual Well-Being/Religious Activities in Muslim Women with Breast Cancer. *J Relig.Health, 54*(6), 2276-2285. doi:10.1007/s10943-014-9978-0 [doi];10.1007/s10943-014-9978-0 [pii]. Retrieved from PM:25487182

Klyushnenkova, E. N., Sorkin, J. D., & Gallicchio, L. (2015). Association of obesity and sleep problems among breast cancer survivors: results from a registry-based survey study. *Support.Care Cancer, 23*(12), 3437-3445. doi:10.1007/s00520-015-2692-y [doi];10.1007/s00520-015-2692-y [pii]. Retrieved from PM:25773672

Kwekkeboom, K. L., Cherwin, C. H., Lee, J. W., & Wanta, B. (2010). Mind-body treatments for the pain-fatigue-sleep disturbance symptom cluster in persons with cancer. *J Pain Symptom.Manage, 39*(1), 126-138. doi:S0885-3924(09)00793-3 [pii];10.1016/j.jpainsymman.2009.05.022 [doi]. Retrieved from PM:19900778

Liu, L., Fiorentino, L., Rissling, M., Natarajan, L., Parker, B. A., Dimsdale, J. E. et al. (2013). Decreased health-related quality of life in women with breast cancer is associated with poor sleep. *Behav Sleep Med, 11*(3), 189-206. doi:10.1080/15402002.2012.660589 [doi]. Retrieved from PM:23205513

Ma, C. L., Chang, W. P., & Lin, C. C. (2014). Rest/activity rhythm is related to the coexistence of pain and sleep disturbance among advanced cancer patients with pain. *Support.Care Cancer, 22*(1), 87-94. doi:10.1007/s00520-013-1918-0 [doi]. Retrieved from PM:23995812

Makari-Judson, G., Braun, B., Jerry, D. J., & Mertens, W. C. (2014). Weight gain following breast cancer diagnosis: Implication and proposed mechanisms. *World J Clin Oncol., 5*(3), 272-282. doi:10.5306/wjco.v5.i3.272 [doi]. Retrieved from PM:25114844

Montazeri, A., Vahdaninia, M., Ebrahimi, M., & Jarvandi, S. (2003). The Hospital Anxiety and Depression Scale (HADS): translation and validation study of the Iranian version. *Health Qual.Life Outcomes., 1* , 14. doi:10.1186/1477-7525-1-14 [doi]. Retrieved from PM:12816545

Mousavi, S. M., Gouya, M. M., Ramazani, R., Davanlou, M., Hajsadeghi, N., & Seddighi, Z. (2009). Cancer incidence and mortality in Iran. *Ann Oncol., 20*(3), 556-563. doi:mdn642 [pii];10.1093/annonc/mdn642 [doi]. Retrieved from PM:19073863

Nishiura, M., Tamura, A., Nagai, H., & Matsushima, E. (2015). Assessment of sleep disturbance in lung cancer patients: relationship between sleep disturbance and pain, fatigue, quality of life, and psychological distress. *Palliat.Support.Care, 13*(3), 575-581. doi:S1478951513001119 [pii];10.1017/S1478951513001119 [doi]. Retrieved from PM:24524428

Otte, J. L., Carpenter, J. S., Russell, K. M., Bigatti, S., & Champion, V. L. (2010). Prevalence, severity, and correlates of sleep-wake disturbances in long-term breast cancer survivors. *J Pain Symptom.Manage, 39*(3), 535-547. doi:S0885-3924(09)01127-0 [pii];10.1016/j.jpainsymman.2009.07.004 [doi]. Retrieved from PM:20083371

Palamaner Subash, S. G., Kumar, A. A., Cheskin, L. J., & Pancholy, S. B. (2015). Association between sleep-disordered breathing, obstructive sleep apnea, and cancer incidence: a systematic review and meta-analysis. *Sleep Med, 16*(10), 1289-1294. doi:S1389-9457(15)00777-7 [pii];10.1016/j.sleep.2015.04.014 [doi]. Retrieved from PM:26212231

Payne, J. K., Held, J., Thorpe, J., & Shaw, H. (2008). Effect of exercise on biomarkers, fatigue, sleep disturbances, and depressive symptoms in older women with breast cancer receiving hormonal therapy. *Oncol.Nurs Forum, 35*(4), 635-642. doi:8R2XJ71041W62485 [pii];10.1188/08.ONF.635-642 [doi]. Retrieved from PM:18591167

Playdon, M. C., Bracken, M. B., Sanft, T. B., Ligibel, J. A., Harrigan, M., & Irwin, M. L. (2015). Weight Gain After Breast Cancer Diagnosis and All-Cause Mortality: Systematic Review and Meta-Analysis. *J Natl.Cancer Inst., 107*(12), djv275. doi:djv275 [pii];10.1093/jnci/djv275 [doi]. Retrieved from PM:26424778

Redeker, N. S., Pigeon, W. R., & Boudreau, E. A. (2015). Incorporating measures of sleep quality into cancer studies. *Support.Care Cancer, 23*(4), 1145-1155. doi:10.1007/s00520-014-2537-0 [doi]. Retrieved from PM:25510361

Rogers, L. Q., Fogleman, A., Trammell, R., Hopkins-Price, P., Spenner, A., Vicari, S. et al. (2015). Inflammation and psychosocial factors mediate exercise effects on sleep quality in breast cancer survivors: pilot randomized controlled trial. *Psychooncology., 24*(3), 302-310. doi:10.1002/pon.3594 [doi]. Retrieved from PM:24916951

Roscoe, J. A., Kaufman, M. E., Matteson-Rusby, S. E., Palesh, O. G., Ryan, J. L., Kohli, S. et al. (2007). Cancer-related fatigue and sleep disorders. *Oncologist., 12(Suppl 1)*, 35-42. doi:12/suppl_1/35 [pii];10.1634/theoncologist.12-S1-35 [doi]. Retrieved

from PM:17573454

Saadatpour, L., Hemati, S., Habibi, F., Behzadi, E., Hashemi-Jazi, M. S., Kheirabadi, G. et al. (2015). Linguistic Validation of the M. D. Anderson Symptom Inventory in Persian-Speaking Iranian Cancer Patients. *J Pain Symptom.Manage, 50*(3), 387-393. doi:S0885-3924(15)00192-X [pii];10.1016/j.jpainsymman.2015.03.018 [doi]. Retrieved from PM:25980966

Safaee, A., & Moghim, D. B. (2007). Validation study of a quality of life (QOL) questionnaire for use in Iran. *Asian Pac.J Cancer Prev., 8*(4), 543-546. Retrieved from PM:18260726

Sanford, S. D., Wagner, L. I., Beaumont, J. L., Butt, Z., Sweet, J. J., & Cella, D. (2013). Longitudinal prospective assessment of sleep quality: before, during, and after adjuvant chemotherapy for breast cancer. *Support.Care Cancer, 21*(4), 959-967. doi:10.1007/s00520-012-1612-7 [doi]. Retrieved from PM:23052918

Sateia, M. J., & Lang, B. J. (2008). Sleep and cancer: recent developments. *Curr.Oncol.Rep., 10*(4), 309-318. Retrieved from PM:18778557

Tang, M. F., Liou, T. H., & Lin, C. C. (2010). Improving sleep quality for cancer patients: benefits of a home-based exercise intervention. *Support.Care Cancer, 18*(10), 1329-1339. doi:10.1007/s00520-009-0757-5 [doi]. Retrieved from PM:19834744

Trajkovic-Vidakovic, M., de Grae, A., Voest, E. E., & Teunissen, S. C. (2012). Symptoms tell it all: a systematic review of the value of symptom assessment to predict survival in advanced cancer patients. *Crit Rev Oncol.Hematol., 84*(1), 130-148. doi:S1040-8428(12)00050-9 [pii];10.1016/j.critrevonc.2012.02.011 [doi]. Retrieved from PM:22465016

Tuomilehto, H., Seppa, J., & Uusitupa, M. (2013). Obesity and obstructive sleep apnea--clinical significance of weight loss. *Sleep Med Rev, 17*(5), 321-329. doi:S1087-0792(12)00097-4 [pii];10.1016/j.smrv.2012.08.002 [doi]. Retrieved from PM:23079209

Vargas, S., Wohlgemuth, W. K., Antoni, M. H., Lechner, S. C., Holley, H. A., & Carver, C. S. (2010). Sleep dysfunction and psychosocial adaptation among women undergoing treatment for non-metastatic breast cancer. *Psychooncology., 19*(6), 669-673. doi:10.1002/pon.1603 [doi]. Retrieved from PM:19626593

Vostakolaei, F. A., Broeders, M. J., Rostami, N., van Dijck, J. A., Feuth, T., Kiemeney, L. A. et al. (2012). Age at diagnosis and breast cancer survival in iran. *Int.J Breast Cancer, 2012*, 517976. doi:10.1155/2012/517976 [doi]. Retrieved from PM:23227345

Yennurajalingam, S., Balachandran, D., Pedraza Cardozo, S. L., Berg, E. A., Chisholm, G. B., Reddy, A. et al. (2015). Patient-reported sleep disturbance in advanced cancer: frequency, predictors and screening performance of the Edmonton Symptom Assessment System sleep item. *BMJ Support.Palliat.Care*. doi:bmjspcare-2015-000847 [pii];10.1136/bmjspcare-2015-000847 [doi]. Retrieved from PM:26475092