Association between Poor Sleep Quality with Anxiety and Depression Scores among Patients with Urological Cancers

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Abstract

Background and Objective: It has been postulated that patients with cancer experience various degrees of poor sleep quality at different points of disease courses. On the other hand, a high proportion of patients with cancer present symptoms of anxiety and depression. The purpose of the study was to assess the association of sleep quality with anxiety and depression in patients with urological cancers.

Materials and Methods: The present study was a cross-sectional study performed in the Cancer Registry Center at Tehran University of Medical Sciences, Tehran, Iran, in 2019-2020. For eligible patients, demographic data were collected from their records, and Pittsburgh Sleep Quality Index (PSQI) questionnaire, Hamilton Anxiety Rating Scale (HAM-A), and Hamilton Rating Scale for Depression (HAM-D) were completed for each patient.

Results: The mean $\pm$ SD age of participants was 64.1 ± 14.5 years, and the most of patients were male (90.1%). In total, 142 patients were enrolled in the study, and 92 patients (64.8%) were categorized as patients with poor sleep quality. The mean global score was 7.85 ± 3.94, and the mean of anxiety and depression was 10.85 ± 6.80 and 15.30 ± 4.90, respectively. The regression analysis showed that for one-unit increase in sleep quality score, the anxiety score significantly increased by 0.98 unit [95% confidence interval (CI): 0.74-1.22, $P < 0.001$], and for depression significantly increased by 0.69 unit (95% CI: 0.52-0.87, $P < 0.001$).

Conclusion: More than half of our patients suffer from poor sleep quality, associated with anxiety and depression symptoms.

Keywords: Sleep quality; Anxiety; Depression; Cancer; Urology

Introduction

Nowadays, urological cancers are detected at increasing frequencies and taken into account as one of the most newly-diagnosed cancers worldwide (1). Similarly, urological cancers, mainly bladder cancer, prostate cancer, and renal cell carcinoma have increased incidence rates in Iran and, due to high prevalence, morbidity, and mortality reflect a significant public health issue (2). Urological cancer mortality has decreased since the 1990s in Iran (3). Therefore, the focus on survivorship issues like psychological disorders has been increased (4).

Behavioral symptoms including sleep disturbance, psychosocial distress, and depression have been considered the common adverse effects in patients with cancer (5, 6). It has been postulated that patients with cancer experience various degrees of

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poor sleep quality at different points of disease courses, ranging from diagnosis to end stages of the disease (7), and its prevalence is different among different types of cancers (8). Sleep disturbance can increase susceptibility of patients with cancer to developing depression symptoms (9), and a positive association between them, especially in prostate cancer survivors, has been detected (10). The results of study performed by Miaskowski et al. showed that by increasing the level of sleep disturbance in patients with prostate cancer, the higher levels of depression and anxiety can be expected (11).

Moreover, a high proportion of patients with cancer present symptoms of psychological distress and depression. Patients with cancer are at about three to five times more risks of major depression compared with the general population (6, 12, 13). Depression among patients with cancer has a wide range of prevalence, depending on various factors, including the type of cancer, the depression definition, and the method of depression assessment (8). The mentioned adverse effects can negatively influence the quality of life and functional status of the patients (7, 9, 14) and it is generally believed that anxiety and depression in patients who are suffering from cancer will interrupt patients' adherence to treatment (15, 16).

We found out that there was a lack of studies regarding the association between sleep quality and anxiety and depression in patients with different types of urological cancers; hence, we designed a study to assess the association of sleep quality with anxiety and depression in patients with urological cancers.

Materials and Methods

The present study was a cross-sectional study performed in the Cancer Registry Center at Tehran University of Medical Sciences, Tehran, Iran, in 2019-2020. The patients with urological cancers were selected randomly from the cancer registration system, and the patients who had a history of psychiatric disorders and drug addiction were excluded from the study. Eligible patients were called by telephone, and the aim of the study was explained. From the patients who were satisfied with participating in the study, verbal consent was obtained, and they were invited to the Cancer Registry Center to complete questionnaires. The Ethics Committee of Tehran University of Medical Sciences approved the study (IR.TUMS.VCRREC.1398.437).

Demographic information was collected from patient's records, and the questionnaires were completed through a face-to-face interview with each patient. In the present study, sleep quality, anxiety, and depression were assessed by standard questionnaires. Sleep quality was evaluated by the Pittsburgh Sleep Quality Index (PSQI); this questionnaire is a valid instrument to assess both sleep quality and factors that affect sleep quality (17). The PSQI includes 19 items in 7 sections that create one global score and the range of global score varies between 0 and 21. A global score of higher than five is categorized as patients with poor sleep (18, 19). The reliability and validity of PSQI were assessed in the Iranian population in Farrahi et al.'s study (20).

Hamilton Anxiety Rating Scale (HAM-A) questionnaire was used to assess anxiety status of patients (21). According to global score, patients were categorized in four groups; patients without anxiety (score < 8), patients with mild anxiety (score 8-14), moderate anxiety (score 15-23), and severe anxiety (score > 24) (22). Hamilton Rating Scale for Depression (HAM-D) was used to measure depression (23). The global score between 0 to 6 indicates no depression, a score from 7 to 17 indicates mild depression, 18-24 indicates moderate depression, and higher than 24 indicates severe depression (24).

Statistical analysis: The continuous and discrete variables were described using mean [standard deviation (SD)] and number (percent), respectively. The Chi-squared test was used to compare the categorical variables, between groups. Moreover, Pearson correlation was the tool for evaluating the associations between the PSQI components and the global score with the anxiety and depression scores. Accordingly, the correlations in the absolute ranges of 0-0.19, 0.2-0.39, 0.4-0.59, 0.6-0.79, and 0.8-1 would be graded as very week, week, moderate, strong, and very strong, respectively. The effect of independent variables on sleep quality scores was analyzed using multivariate linear regression. Data were analyzed by STATA software (version 11, STATA Corporation, College Station, TX, USA), and P-value less than 0.05 indicated a statistically significant difference.

Results

The descriptive characteristics of the study participants are presented in table 1. In total, 142 patients were enrolled in the study, and 92 patients (64.8%) were categorized as patients with poor sleep quality.

Table 1. Descriptive characteristics of study participants

		Total (n = 142) [n (%)]	PSQI > 5 (n = 92) [n (%)]	PSQI ≤ 5 (n = 50) [n (%)]	P-value
Age group (year)	30-49	22 (15.5)	15 (68.2)	7 (31.8)	0.200
	50-69	66 (46.5)	38 (57.6)	28 (42.4)	
	≥ 70	54 (38.0)	39 (72.2)	15 (27.8)	
Sex	Women	14 (9.9)	9 (64.3)	5 (35.7)	0.900
	Men	128 (90.1)	83 (64.8)	45 (35.1)	
Education	Illiterate/elementary	42 (29.6)	32 (76.2)	10 (23.8)	0.200
	High school	28 (19.7)	19 (68.0)	9 (32.1)	
	Diploma	44 (31.0)	26 (59.1)	18 (40.9)	
	University degree	28 (19.7)	15 (53.6)	13 (46.4)	
Type of cancer	Prostate	49 (34.5)	31 (63.3)	18 (36.7)	0.500
	Kidney	25 (17.6)	15 (60.0)	10 (40.0)	
	Bladder	65 (45.8)	45 (69.2)	20 (31.0)	
	Testis	3 (2.1)	1 (33.3)	2 (66.7)	
Anxiety	No anxiety	53 (37.3)	19 (35.8)	34 (64.1)	< 0.001
	Mild	50 (35.2)	39 (78.0)	11 (22.0)	
	Moderate	33 (23.2)	28 (85.0)	5 (15.1)	
	Severe	6 (4.2)	6 (100)	0 (0)	
Depression	No depression	2 (1.4)	0 (0)	2 (100)	0.001
	Mild	98 (69.0)	55 (56.1)	43 (44.0)	
	Moderate	37 (26.1)	33 (89.2)	4 (10.8)	
	Severe	5 (3.5)	4 (80.0)	1 (20.0)	

PSQI: Pittsburgh Sleep Quality Index

The mean ($\pm$ SD) age of participants was 64.1 ±14.5 years, and the most of patients were male (90.1%). The most common types of cancer in the study were bladder (45.8%) and prostate (34.5%) cancers. Significantly, the higher percent of severe (100%), moderate (85%), and mild (78%) anxiety were observed in patients with poor sleep quality (P < 0.001) in comparison with patients with good sleep quality. In addition, patients with poor sleep quality experienced more severe (80%), moderate (89.2%), and mild (56.1%) depression compared to good sleepers (P = 0.001).
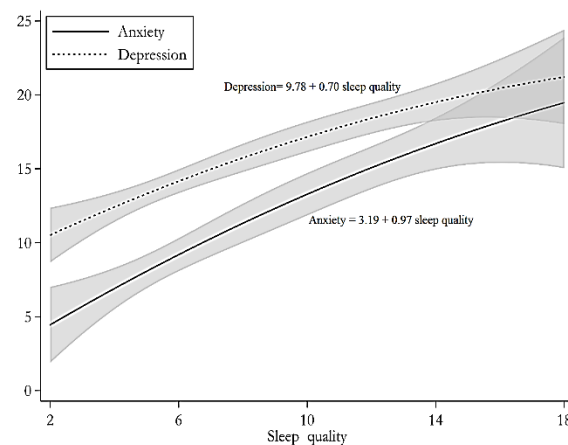
In table 2, the mean of PSQI components and global scores are shown. The mean global score was 7.85 ± 3.94, and the mean of PSQI components was from 0.30 to 1.54; the highest mean was reported in "subjective sleep quality", and the lowest mean was presented in "use of sleep medication".

Table 2. Mean of Pittsburgh Sleep Quality Index (PSQI) components and global scores

	Mean ± SD
Subjective sleep quality	1.54 ± 0.79
Sleep latency	1.36 ± 1.02
Sleep duration	1.26 ± 0.95
Habitual sleep efficiency	1.33 ± 0.87
Sleep disturbances	1.22 ± 0.66
Use of sleeping medication	0.30 ± 0.75
Daytime dysfunction	0.85 ± 0.92
PSQI global score	7.85 ± 3.94

PSQI: Pittsburgh Sleep Quality Index; SD: Standard deviation

The associations between sleep quality with anxiety and depression are shown in figure 1. A positive correlation was found between quality of sleep and anxiety and depression. By reducing the quality of sleep, the scores of depression and anxiety raised in patients.

Figure 1. Association between sleep quality with anxiety and depression

The correlations between PSQI components and global score with anxiety and depression are presented in table 3. Except for the sleep duration and medication use, there was a significant correlation between the global score and PSQI components with an anxiety score (P < 0.001).

Table 3. Correlations between Pittsburgh Sleep Quality Index (PSQI) component and global scores with anxiety and depression

	PSQI	Subjective sleep quality	Sleep latency	Sleep duration	Habitual sleep efficiency	Sleep disturbances	Use of sleeping medication	Daytime dysfunction
Anxiety	0.57	0.31	0.31	0.25	0.43	0.55	0.25	0.57
P-value	< 0.001	< 0.001	< 0.001	0.100	< 0.001	< 0.001	0.100	< 0.001
Depression	0.56	0.35	0.31	0.31	0.50	0.45	0.15	0.60
P-value	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	> 0.999	< 0.001

PSQI: Pittsburgh Sleep Quality Index

There were moderate correlations between PSQI (r = 0.57), daytime dysfunction (r = 0.57), and sleep disturbances (r = 0.55) with anxiety. Similar results were found for depression. The highest associations were observed for PSQI (r = 0.56) and daytime dysfunction (r = 0.60) with depression (P < 0.001).

In table 4, the regression analysis between sleep quality and anxiety and depression is shown. In model II, for one-unit increase in sleep quality score, the anxiety score significantly increased by 0.98 unit [95% confidence interval (CI): 0.74-1.22, P < 0.001], and for depression significantly increased by 0.69 unit (95% CI: 0.52-0.87, P < 0.001).

Table 4. Regression analysis of determinants of sleep quality

Anxiety	Sleep quality		
	Coefficient	95% CI	P-value
Model I[1]	0.97	0.74-1.21	< 0.001
Model II[2]	0.98	0.74-1.22	< 0.001
Depression			
Model I[1]	0.70	0.53-0.87	< 0.001
Model II[2]	0.69	0.52-0.87	< 0.001

[1]Not adjusted (crude models); [2]Adjusted for age, sex, education
CI: Confidence interval

Discussion

In the present study, more than half of our patients experienced poor sleep quality. The significant correlations were observed between poor quality of sleep and high scores of depression and anxiety. Therefore, our findings suggested that sleep quality could be a predictor of anxiety and depression among patients with urological cancers.

Sleep disturbance prevalence varies from 4% to 29% among the general population (25), and these figures increases in patients with cancer and are twice that of the general population (27). Previous studies showed that the percentage of the poor sleepers is 96.34% (26) and 73.5% (28) among patients with cancer. In our study, most patients (64.8%) were poor sleepers; as a result, poor sleep quality was more prevalent among patients with cancer than the general population. Studies have established that poor sleep quality might result from side effects of treatment, physical pain (29), low quality of life, post-traumatic experience (26), and hopelessness (28). Therefore, screening of patients and psychological intervention could be helpful to manage and improve sleep quality in patients with cancer.

The findings of current study showed that there was no significant association between sleep quality and age, which was consistent with the previous study (25); nevertheless in some studies, sleep quality gets poorer among old patients (26, 27). Previous studies have revealed that sleep disorders are more prevalent among women than men (28, 29). However, our findings did not support these studies and were consistent with other documents (25, 26); it seemed that there was no significant association between gender and sleep quality. Previous document reported a notable association between quality of sleep and cancer types, and its rate varies by type of cancer (29, 30), but our findings did not support an association between sleep quality and cancer type, similar to the previous study (31).

The findings of present study showed the notable correlation between anxiety and all PSQI subscales except sleep duration and use of sleeping medication, and our findings agreed with previous studies (32, 33). In a study that was performed among patients with advanced cancer, a significant association between PSQI components and depression was found (25), and these results were consistent with our findings. But in another study, only the use of sleeping medication and daytime dysfunction were significantly related to depression (33). Studies mentioned that because of the closeness between sleep disorders and anxiety symptoms, and since many symptoms of sleep disorders appear as anxiety features, treatment for anxiety might improve and disappear symptoms of sleep disorders (33).

There is much evidence to implicate a significant association between poor sleep quality with depression and anxiety among patients with cancer (10, 11, 25, 34), and our findings supported the prior studies. Such findings hypothesized that poor sleep quality causes dysregulation of stress pathways contributed to the development of depression (35) through hyperactivity of hypothalamic-pituitary-adrenal (HPA) axis and dysregulation of cortisol activity (36, 37). This association between depression and HPA activity was observed among patients with cancer (38, 39). Therefore, improving sleep quality could be helpful to reduce depression and anxiety rates in patients with cancer.

According to our knowledge, it is the first survey investigated the association between quality of sleep and depression and anxiety in patients with urological cancers. The limitation of the pre-

sent study was that the causal relationships between sleep quality with anxiety and depression could not be discussed because of the cross-sectional design. In addition, lack of clinical data regarding the disease stage, treatment regimens, and medications was the other limitation in the present study, as these factors could affect patients' sleep, mood, and psychological status. Moreover, there was a selection bias, because patients who suffered from sleep disorders were more likely to participate in this study.

Conclusion

More than half of patients with urological cancers has poor sleep quality. Furthermore, patients with poor sleep quality had more depression and anxiety problems.

Conflict of Interests

Authors have no conflict of interests.

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References

1. Shin DW, Park HS, Lee SH, et al. Health-related quality of life, perceived social support, and depression in disease-free survivors who underwent curative surgery only for prostate, kidney and bladder cancer: comparison among survivors and with the general population. Cancer Res Treat 2019; 51: 289-99.

2. Basiri A, Shakhssalim N, Jalaly NY, et al. Difference in the incidences of the most prevalent urologic cancers from 2003 to 2009 in Iran. Asian Pac J Cancer Prev 2014; 15: 1459-63.

3. Pishgar F, Amini E, Gohari K, et al. National and subnational mortality of urological cancers in Iran, 1990-2015. Asia Pac J Clin Oncol 2019; 15: e43-e48.

4. Watts S, Leydon G, Birch B, et al. Depression and anxiety in prostate cancer: A systematic review and meta-analysis of prevalence rates. BMJ Open 2014; 4: e003901.

5. Echchikhi Y, el Abbassi S, Touil A, et al. Sleep disorders and sleep quality in moroccan adult patients with cancer during treatment. J Cancer Sci Ther 2017; 9: 637-43.

6. Symonds P, Lord KW, Mitchell AJ. Life After urological cancer–psychological issues. In: Nargund VH, Raghavan D, Sandler HM, editors. Urological oncology. London, UK: Springer London; 2015. p. 323-36.

7. Barichello E, Sawada NO, Sonobe HM, et al. Quality of sleep in postoperative surgical oncologic patients. Rev Latino-am Enfermagem 2009; 17: 481-8.

8. Fann JR, Thomas-Rich AM, Katon WJ, et al. Major depression after breast cancer: A review of epidemiology and treatment. Gen Hosp Psychiatry 2008; 30: 112-26.

9. Irwin MR, Olmstead RE, Ganz PA, et al. Sleep disturbance, inflammation and depression risk in cancer survivors. Brain Behav Immun 2013; 30 Suppl: S58-S67.

10. Dirksen SR, Epstein DR, Hoyt MA. Insomnia, depression, and distress among outpatients with prostate cancer. Appl Nurs Res 2009; 22: 154-8.

11. Miaskowski C, Paul SM, Cooper BA, et al. Predictors of the trajectories of self-reported sleep disturbance in men with prostate cancer during and following radiation therapy. Sleep 2011; 34: 171-9.

12. Miller AH, Ancoli-Israel S, Bower JE, et al. Neuro-endocrine-immune mechanisms of behavioral comorbidities in patients with cancer. J Clin Oncol 2008; 26: 971-82.

13. Rooney AG, McNamara S, Mackinnon M, et al. Frequency, clinical associations, and longitudinal course of major depressive disorder in adults with cerebral glioma. J Clin Oncol 2011; 29: 4307-12.

14. Groenvold M, Petersen MA, Idler E, et al. Psychological distress and fatigue predicted recurrence and survival in primary breast cancer patients. Breast Cancer Res Treat 2007; 105: 209-19.

15. DiMatteo MR, Lepper HS, Croghan TW. Depression is a risk factor for noncompliance with medical treatment: Meta-analysis of the effects of anxiety and depression on patient adherence. Arch Intern Med 2000; 160: 2101-7.

16. Pasquini M, Biondi M. Depression in cancer patients: A critical review. Clin Pract Epidemiol Ment Health 2007; 3: 2.

17. Buysse DJ, Reynolds CF, III, Monk TH, et al. The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research. Psychiatry Res 1989; 28: 193-213.

18. Bruno RM, Palagini L, Gemignani A, et al. Poor sleep quality and resistant hypertension. Sleep Med 2013; 14: 1157-63.

19. Matsuda R, Kohno T, Kohsaka S, et al. The prevalence of poor sleep quality and its association with depression and anxiety scores in patients admitted for cardiovascular disease: A cross-sectional designed study. Int J Cardiol 2017; 228: 977-82.

20. Farrahi MJ, Nakhaee N, Sheibani V, et al. Reliability and validity of the Persian version of the Pittsburgh Sleep Quality Index (PSQI-P). Sleep Breath 2012; 16: 79-82.

21. Hamilton M. The assessment of anxiety states by rating. Br J Med Psychol 1959; 32: 50-5.

22. Matza LS, Morlock R, Sexton C, et al. Identifying HAM-A cutoffs for mild, moderate, and severe generalized anxiety disorder. Int J Methods Psychiatr Res 2010; 19: 223-32.

23. Hamilton M. The Hamilton Rating Scale for Depression. In: Sartorius N, Ban TA, editors. Assessment of Depression. Berlin, Heidelberg: Springer Berlin Heidelberg; 1986. p. 143-52.

24. Riedel M, Moller HJ, Obermeier M, et al. Response and remission criteria in major depression--a validation of current practice. J Psychiatr Res 2010; 44: 1063-8.

25. Mystakidou K, Parpa E, Tsilika E, et al. Sleep quality in advanced cancer patients. J Psychosom Res 2007; 62: 527-33.

26. Byles JE, Mishra GD, Harris MA. The experience of insomnia among older women. Sleep 2005; 28: 972-9.

27. Savard J, Simard S, Hervouet S, et al. Insomnia in men treated with radical prostatectomy for prostate cancer. Psychooncology 2005; 14: 147-56.

28. Savard J, Morin CM. Insomnia in the context of cancer: A review of a neglected problem. J Clin Oncol 2001; 19: 895-908.

29. Davidson JR, MacLean AW, Brundage MD, et al. Sleep disturbance in cancer patients. Soc Sci Med 2002; 54: 1309-21.

30. Davis MP, Khoshknabi D, Walsh D, et al. Insomnia in patients with advanced cancer. Am J Hosp Palliat Care 2014; 31: 365-73.

31. Akman T, Yavuzsen T, Sevgen Z, et al. Evaluation of sleep disorders in cancer patients based on Pittsburgh Sleep Quality Index. Eur J Cancer Care (Engl) 2015; 24: 553-9.

32. Ramsawh HJ, Stein MB, Belik SL, et al. Relationship of anxiety disorders, sleep quality, and functional impairment in a community sample. J Psychiatr Res 2009; 43: 926-33.

33. Potvin O, Lorrain D, Belleville G, et al. Subjective sleep characteristics associated with anxiety and depression in older adults: A population-based study. Int J Geriatr Psychiatry 2014; 29: 1262-70.

34. Mystakidou K, Parpa E, Tsilika E, et al. How is sleep quality affected by the psychological and symptom distress of advanced cancer patients? Palliat Med 2009; 23: 46-53.

35. Irwin MR. Why sleep is important for health: A psychoneuroimmunology perspective. Annu Rev Psychol 2015; 66: 143-72.

36. Gold PW. The organization of the stress system and its dysregulation in depressive illness. Mol Psychiatry 2015; 20: 32-47.

37. Besedovsky L, Lange T, Born J. Sleep and immune function. Pflugers Arch 2012; 463: 121-37.

38. Lutgendorf SK, Weinrib AZ, Penedo F, et al. Interleukin-6, cortisol, and depressive symptoms in ovarian cancer patients. J Clin Oncol 2008; 26: 4820-7.

39. Sephton SE, Dhabhar FS, Keuroghlian AS, et al. Depression, cortisol, and suppressed cell-mediated immunity in metastatic breast cancer. Brain Behav Immun 2009; 23: 1148-55.