

Original Article



Sleep Quality and Cancer-Related Fatigue in Patients with Cancer

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Abstract

Introduction: Sleep problems and fatigue are common symptoms reported by cancer patients. In this study, the researchers used a specialized tool to measure fatigue in cancer patients and its relationship with sleep quality in Yazd, Iran.**Methods:** This descriptive correlational study included 149 cancer patients (age range: over 18 years) referred to Shahid Sadoughi Hospital in Yazd, Iran. Data were collected by the Pittsburgh Sleep Quality Index (PSQI) and Cancer-Related Fatigue Questionnaire. A PSQI score of ≥ 5 indicated a poor sleep. Data were analyzed using SPSS Statistics for Windows, version 13.0 (SPSS Inc., Chicago, IL, USA), Pearson's correlation, t test, analysis of variance (ANOVA), and linear regression.**Results:** The mean (SD) PSQI score of patients was 13 (4.85) out of 21. About 69.3% of patients had a poor sleep quality. While the mean (SD) of sleep duration was 5.57 (0.54) hours, it was 69.44 (46.58) minutes for sleep latency. Also, with increasing the mean of sleep quality, the mean of fatigue significantly increased ($P < 0.001$, $R = 0.63$).**Conclusion:** According to the results, there was a relationship between the sleep quality and fatigue in cancer patients, so that patients with better sleep quality had less fatigue.

Introduction

Sufficient sleep is an effective element in physical and mental health.¹ A good sleep provides physical restoration through anabolic functions such as protein and tissue synthesis.² Over the recent years, researchers and specialists have paid more attention to the relationship between sleep and cancer.³⁻⁵

Cancer has been considered one of the major public health threats for public health systems in the world.⁶ Patients with cancer may experience various problems such as sleep problems, fatigue, depression, anxiety, worries and treatment problems. Sleep disorders in patients with cancer are approximately double than general population (12-25% in the general population and 30-50% in oncology patients).⁷

Sleep disorders include a range of symptoms such as waking early in the morning, daytime sleepiness, waking up and having trouble getting back to sleep and difficulty falling asleep.⁸ Approximately, 20-70% of breast cancer patients suffer of insomnia.⁹ Tag Eldin et al., reported that short sleep duration, decrease of sleep efficiency, sleep latency was significantly more in patients with cancer compared to healthy people.¹⁰ Chen et al., indicated that

patients with cancer and their intimate partners have poor sleep quality.¹¹ Indeed, recent scientific evidence shows that a correct assessment of sleep disorders in cancer patients suggested interesting therapeutic views in the treatment of cancer patients.¹²

In the other hand, cancer-related fatigue (CRF) is common problem in the cancer patients. But little is known of its relationship with mental health, pain and sleep in the cancer patients.¹³ The majority of cancer patients experience moderate to severe CRF during primary treatments. In addition, CRF may continue in cancer survivors for months and years after treatment. CRF can be effective in quality of life.¹⁴ Porro et al., showed Quality of life and fatigue was as the predictors of return to work in women with breast cancer.¹⁵

Fatigue in cancer patients differs from fatigue in non-patients. CRF has a wide range of symptoms, including persistent and distressing physical, emotional, and/or cognitive weakness, tiredness, and lack of energy. In this type of fatigue, the patient feels tired without doing any specific activity. There is a hypothesis regarding this type of fatigue indicating that it often does not get better by sleeping or resting.¹⁶ On the contrary, it is hypothesized

that this fatigue will improve automatically with improved sleep problems.¹⁴ For example, napping during the day can improve fatigue. On the other hand, napping during the day can increase fatigue during the next day by reducing nighttime sleep.

Although fatigue is one of the most common symptoms in cancer patients, but little information is available on the relationship between fatigue and sleep quality. Limited studies have been conducted in Iran on the relationship between fatigue and sleep quality in adults with cancer, and most have examined fatigue and sleep quality separately. Imanian et al., examined the association between fatigue and sleep in breast cancer patients. They used the Brief Fatigue Inventory (BFI) questionnaire to assess fatigue. BFI is a general questionnaire that does not focus on a specific disease.¹⁷ It is also worth mentioning that a fatigue questionnaire for cancer patients was designed for the Iranian population in 2017, and its validity and reliability were reviewed and confirmed.¹⁸

If there is a significant relationship between fatigue and sleep quality, doctors can improve fatigue by adjusting the sleep rhythm and reducing sleep disorders in cancer patients. Therefore, following the improvement of fatigue, treatment tolerance increases, and mood disorders and depression improve. Due to the lack of studies on the relationship between fatigue and sleep quality in cancer patients, researchers decided to use a specialized tool to measure fatigue in cancer patients and its relationship with sleep quality.

Materials and Methods

This study is a descriptive study that conducted in Yazd province in 2017 to examine the correlation between sleep quality and fatigue in hospitalized patients with cancers aged 18 years and older who referred to the Shahid Sadoughi Hospital in Yazd, Iran. The sample size was determined to be 141, based on a confidence interval (CI) of 95% and standard deviation of 4.25 based on a similar study¹⁹ and error estimation of the mean of 0.7, which was increased to 150 to account for potential missing cases. Sampling was conducted based on the convenience sampling method.

The inclusion criteria for the patients were comprised of age ≥ 18 years, diagnosis of cancer via doctor's approval, start the treatment process and consent to participate in this study. Also, patients who had not responded to all questions and non-native people were excluded from this study.

The data were collected by the questionnaire. The first part of the questionnaire was related to the demographic variables (age, educational level, job type, etc) and disease-related variables (the type of cancer, duration of cancer and methods of treatment).

The quantity and quality of sleep during the past month (four weeks) was measured with Pittsburgh Sleep Quality Index (PSQI). PSQI is a self-report questionnaire

developed by researchers at the University of Pittsburgh.²⁰ PSQI had 19 questions in 7 components included subjective sleep quality; sleep latency, that is the amount of time that it takes to fall asleep; sleep duration; habitual sleep efficiency, that is the percentage of the actual hours of sleep divided by the hours spent in bed; sleep disturbances; use of sleeping medications; and daytime dysfunction. The score range of each question was from 0 to 3 points; with a total score range from 0 to 21. A PSQI score of ≥ 5 identified as poor sleepers.²¹ The reliability and validity of the questionnaire have been confirmed in Backhaus et al., study with a Cronbach's alpha of 0.85 and intra-class correlation coefficient (ICC) of 0.87.²⁰ In addition, ICC was 0.87 in Khorrami-Rad et al., study that conducted on breast cancer patients receiving chemotherapy.⁴ The reliability of the questionnaire also confirmed in this study with a Cronbach's alpha of 0.82.

Also, fatigue was measured with CRF questionnaire that designed by Momayyezi et al.¹⁸ This questionnaire had 24 questions in three dimensions including daily activities and general problems (10 questions), sleep problems (9 questions), and mental states and emotions (5 questions). A 4-point Likert-type range was used for scaling (0 = never, 1 = sometime, 2 = usually, and 3 = always) with a total score range from 0 to 72. The higher score shows more fatigue in person. The reliability and validity of the questionnaire have been confirmed in Momayyezi et al., study. Face validity is evaluated by patients and content validity is evaluated by a panel of experts. The reliability of the questionnaire was confirmed using Cronbach's alpha coefficient and Test-retest. Cronbach's alpha coefficient for fatigue questionnaire was 0.95. For assessing repeatability (Test-retest), the questionnaire was completed by 40 patients. After 4 weeks, the questionnaire was completed again by the same patients. Then ICC calculated. According their results ICC was 0.92 for the total questionnaire. Cronbach's alpha coefficient ($\alpha = 0.93$) and Test re-test (ICC = 0.92) were used to assess the reliability of the questionnaire. Construct validity was confirmed by performing factor analysis.¹⁸

The researchers referred to Shahid Sadoughi Hospital in Yazd city for sampling. According to the inclusion criteria, 150 patients with cancer aged 18 years and older who referred to the Shahid Sadoughi Hospital in Yazd entered the study. Initially, Researchers explained the aim of the study to patients. Questionnaires were completed by patients. But, if they were not able to complete, questions were completed by the researcher by face-to-face interview and responses were recorded.

After reviewing the questionnaires, one questionnaire was deleted due to deficiencies in completing the information, and then the information of 149 patients was included in the statistical software.

Data were analyzed using SPSS Statistics for Windows, version 13.0 (SPSS Inc., Chicago, IL, USA). The mean of fatigue based on more than two groups was evaluated

using ANOVA test. The Tukey test was used when researchers need to determine if the interaction among three or more variables is mutually statistically significant. T-test was used to compare the mean of sleep quality based on gender. Pearson's correlation was calculated for the assessment of the correlation between variables. In all the statistical analyses, *P* value of less than 0.05 was considered significant.

Multiple linear regression analysis was also performed to examine the significance of the relevant variables in explaining the variances of the fatigue. The strategy for entering the variables into the regression model was that first each variable entered the linear regression separately (simple linear regression), then the variables with *p*-value less than 0.2 entered the multiple linear regression. Participation in the study was also voluntary.

Results

In this study, sleep quality was assessed in patients with cancer aged 18 years and older in Yazd. The mean (SD) age of the patients was 55.03(9.38) years. Most of the patients were male (60.4%) with less than a high school diploma (68.5%). The results showed that the mean (SD) duration of cancer was 12.45(10.94) months; 27.6% had intestine and colorectal cancer and 20.1% had breast cancer, and 30.9% of patients were treated by all three usual methods (chemotherapy, radiotherapy, and surgery) (Table 1).

The mean (SD) PSQI score was 13(4.85) of the total score 21. Considering a cut-off point of 5, 69.3% of patients had poor sleep quality. The mean (SD) of the PSQI components were as follows: Subjective sleep quality 1.95 (0.86), Sleep efficiency 1.26 (0.28), Daytime dysfunction 1.59 (1.01), Sleep disturbances 1.98 (0.62), Sleep duration 1.52 (1.07), Sleep latency 2.43 (0.75) and use of sleeping medications 2.25 (1.04) of the total score 3 for each item of PSQI components. Therefore, sleep latency and use of sleeping medications had the highest mean and sleep efficiency had the lowest mean. Also, sleep efficiency in most of the patients (58.1%) was more than 85%.

The frequency of sleep disturbance reported by patients with a frequency of 3 times a week was as follows: wakening during the night or in the early morning (48.7%), feeling too hot (24%), having pain (20%), feeling too cold (19.3%), having bad dreams (15.3%), and coughing or snoring (10%), waking up to urinate (9.3%) and waking up due to difficulty breathing (6.7%). With respect to subjective sleep quality, 39.3% of patients rated their sleep quality as fairly good, 26.2% fairly bad and 34.5% very bad. In addition, 21% of the patients reported that keeping up enough enthusiasm to get things done was "a very big problem," 21.8% reported that it was "somewhat of a problem", 36.3% reported that it was "only a very slight problem" and 21 % reported that they had no problem at all.

The mean (SD) sleep duration in patients was 5.57(0.54) hours. Sleep duration was in the range of 2-12 hours in

Table 1. Frequency of socio-demographic and clinical characteristics (N=149)

Variables	N (%)
Gender	
Women	59 (39.6)
Men	90 (60.4)
Economic status	
Bad	75 (50.3)
Moderate	62 (41.6)
Good	12 (8.1)
Educational level	
Illiterate	28 (18.8)
Less than diploma	102 (68.5)
Diploma	9 (6)
University education	10 (6.7)
Job	
Employer	3 (2)
Worker	57 (38.3)
Self-employed	27 (18.1)
Emeritus	4 (2.7)
Unemployed	58 (38.9)
Type of treatment	
Chemotherapy	48 (32.2)
Chemotherapy and radiotherapy	2 (1.3)
Chemotherapy and surgery	53 (35.6)
Chemotherapy, radiotherapy, and surgery	46 (30.9)
Type of cancer	
Liver	10 (6.7)
Leukemia and lymphatic	24 (16.1)
Intestine and colorectal	41 (27.6)
Breast	30 (20.1)
Lung	5 (3.4)
Esophagus and stomach	17 (11.4)
Bladder	9 (6)
Ovarian	7 (4.7)
Skin	4 (2.7)
Prostate	2 (1.3)

participants. The results showed 11.3% of patients slept more than 7 hours, 18.5% between 6-7 hours, 34.7% between 5-6 hours, and 35.5% less than 5 hours during the night. The mean (SD) sleep latency in patients was 69.44 (46.58) minutes. Sleep latency range was between 6-180 minutes. Also, 2.4% of patients took less than 15 minutes, 8.9% between 16-30 minutes, 31.5% between 31-60 minutes and 57.2% higher than 60 minutes to fall asleep after going to bed. The results showed 13.8% of patients only had not taken sleep medicines during the past month. According to the results, 3.4% less than once a week, 25.9% once or twice a week and 56.9% three or more times a week had taken sleep medicines during the

past month.

Based on the Tukey test, the mean of sleep quality and all components were significantly worse in patients who had a worse economic situation ($F = 7.67, P = 0.001$) (Table 2). Also, the mean of sleep quality was higher in patients with colorectal cancer and lung cancer than other types of cancer ($F = 3.21, P = 0.002$) (Table 3). In addition, overall sleep quality, sleep latency, daytime dysfunction, sleep efficiency, sleep duration and subjective sleep quality were significantly worse in patients who were treated by all three methods (chemotherapy, radiotherapy, surgery) than patients who didn't received all three methods (Table 4).

Table 2. Mean of Pittsburgh Sleep Quality Index (PSQI) and fatigue based on socio-demographic

Variable	Sleep quality		Fatigue	
	Mean (SD)	P value	Mean (SD)	P value
Gender		0.23 ^a		0.006 ^{a†}
Women	11.11 (3.96)		51.02 (16.9)	
Men	12.05 (4.03)		59.8 (16.3)	
Economic statue		0.001 ^{b†}		<0.001 ^{b†}
Bad	13.05 (3.83)		63 (15.3)	
Moderate	10.2 (3.74)		49.7 (16.6)	
Good	11 (3.97)		46.11 (12.8)	
Educational level		0.21 ^b		0.01 ^{b†}
Illiterate	11.10 (4.17)		59.5 (16.05)	
Less than diploma	12.18 (3.77)		57.9 (17.4)	
Diploma	9.44 (3.43)		42.4 (11.2)	
University education	12.22 (5.11)		45.8 (12.7)	
Job		0.45 ^b		0.006 ^{b†}
Employer	10.66 (5.68)		46.5 (0.7)	
Worker	12.3 (3.73)		62.1 (15.2)	
Self-employed	12.4 (4.89)		58.7 (18.7)	
Emeritus	10.25 (1.89)		43 (10.4)	
Unemployed	10.95 (3.85)		50.5 (16.7)	

^a Independent t test; ^b ANOVA; [†]Statistically significant.

Table 3. Mean of Pittsburgh Sleep Quality Index (PSQI) and fatigue based on type of cancer

Type of cancer	Sleep quality		Fatigue	
	Mean (SD)	P value ^a	Mean (SD)	P value ^a
Liver	12.8 (4.2)		59.6 (7.8)	
Leukemia and lymphatic	13.2 (4.3)		54.6 (13.2)	
Intestine and colorectal	16.2 (4.9)		67.4 (15.9)	
Breast	13.1 (3.6)		43.6 (14.7)	
Lung	14.7 (4.3)	0.002 [*]	59.2 (21.1)	<0.00 [*]
Esophagus and stomach	9.8 (5.1)		61.2 (11.4)	
Bladder	11.3 (5.2)		46.6 (18.3)	
Ovarian	8.1 (2.1)		41.6 (17.9)	
Skin	12 (4.08)		40 (8.5)	
Prostate	11.5 (0.7)		43 (5.6)	

^a ANOVA; ^{*}Statistically significant.

The results showed that the mean (SD) of fatigue was 53.44 (16.61) (of the total score of 72). The mean (SD) dimensions of fatigue were as follows: daily activities and general problems was 24.93(9.1) (of the total score of 44), the mean (SD) of sleep problems was 16.79 (6.9) (of the total score of 36), and the mean (SD) of mental states and emotions was 11.53 (3.2) (of the total score of 20). The Pearson correlation coefficient showed a significant positive relationship between sleep quality and fatigue; so that the mean of fatigue was significantly increased with increasing the mean of sleep quality ($P < 0.001, R = 0.63$).

There were significant differences between the total mean of fatigue and gender, job, educational level and economic status (Table 2). The results showed that patients with a high school diploma had significantly fewer fatigue than patients with lower education ($F = 3.66, P = 0.01$). In terms of the occupation, workers had a higher score of fatigue than other jobs ($F = 3.79, P = 0.006$). Also, the mean of fatigue was significantly worse in patients who had a worse economic situation ($F = 11.67, P < 0.001$). The mean of fatigue was significantly higher in men than women ($P = 0.006$). The mean of fatigue was higher in patients with colorectal cancer than other types of cancer ($F = 5.83,$

Table 4. Mean of components of Pittsburgh Sleep Quality Index (PSQI) based on the type of treatment

Variables	Mean (SD)				P value ^a
	Chemotherapy	Chemotherapy, radiotherapy and surgery	Chemotherapy & Surgery	Chemotherapy & Radiotherapy	
Sleep latency (min)	2.5 (0.78)	2.7 (0.51)	2.11 (0.83)	2.5 (0.7)	0.005 [*]
Daytime dysfunction	1.82 (0.93)	2.12 (0.88)	1.04 (0.01)	2.0 (0.00)	<0.001 [*]
Sleep disturbances	1.87 (0.6)	2.13 (0.67)	1.95 (0.59)	2.0 (0.00)	0.32
Sleep efficiency	0.95 (0.1)	1.15 (0.28)	0.83 (0.39)	0.7 (0.3)	0.008 [*]
Sleep duration (h)	2.17 (0.9)	2.22 (0.89)	1.45 (0.04)	2.0 (0.00)	0.001 [*]
Use of sleeping medications	2.3 (1.11)	2.35 (0.98)	2.11 (1.07)	2.0 (0.00)	0.75
Subjective sleep quality	2.02 (0.83)	2.21 (0.84)	1.66 (0.84)	1.5 (0.7)	0.02 [*]
Overall sleep quality score	13.65 (4.47)	14.65 (4.8)	11.12 (4.3)	12.5 (2.12)	0.01 [*]

^a ANOVA; ^{*} Statistically significant.

$P < 0.001$) (Table 3). There was no significant difference between the mean of fatigue and treatment method.

In addition, the results showed a significant relationship between all PSQI components and the mean of fatigue (Table 5). The mean score of fatigue was higher in patients who used sleeping medications more than 3 times per week, patients with very bad subjective sleep quality and sleep efficiency of less than 65%, and patients who had sleep duration of less than 5 hours and sleep latency of higher than 60 minutes. In addition, the mean of fatigue increased with increase of the sleep disturbances and daytime dysfunctions (Table 5).

In the present study, linear regression analysis was used to assess the significance of the sleep quality and other variables in explaining the variances of fatigue. According to the multiple linear regressions, the variables included in the model explained 54% of the variance in the fatigue, but only the sleep quality and duration of cancer were significant in the model ($P < 0.001$) (Table 6).

Discussion

The results showed that 69.3% of cancer patients had poor sleep quality based on the cut-off point of PSQI. Also, the overall prevalence of poor sleep quality was 78% in Al Maqbali et al.,²² study, 77.3% in Wu et al.,²³ study and 64% George et al.,²⁴ study which is consistent with the present study. The stress associated with cancer diagnosis and treatment process leads to the release of pro-inflammatory cytokines and this partly explains the high incidence of sleep problems in cancer patients.²⁵

Khorrami-Rad et al., indicated that the mean (SD) of sleep quality was 11.73 (3.73) in patients with breast cancer and according to the cut-off point, 50% of patients had poor sleep quality.⁴ The mean score of sleep quality in patients with cancer was 9.22 in Oman and 6.51 in five sites in Nebraska and South Dakota in Omaha (USA).^{21,26} In addition, the total score of PSQI in breast cancer patients undergoing chemotherapy in the USA was 7.31.¹⁶ A part of this difference is due to differences in geographic regions, genetic differences, the type of cancer and another part due to differences in type of study and data collection tools and sample size.

It seems that admission in hospital, hospitalization in a room with a severely sick person, receive nursing care during the night, rest and inactivity during the day, have complications such as nausea and vomiting, stress and worry about treatment outcomes and many other factors decrease the patient's sleep quality during the night. Sleep disturbance is seen in 30-75% of people with cancer and is almost twice than the general population.⁹ In this study, the most common sleep disturbances in patients were waking up in the middle of the night or early morning, feeling too hot during sleep and having pain. According to Khorrami-Rad et al., study, waking up in the middle of the night or early morning was common sleep disturbances.⁴

In current study, the mean of time to fall asleep after

Table 5. Frequency of components of Pittsburgh Sleep Quality Index (PSQI) and mean of fatigue

Sleep quality parameters	N (%)	Mean (SD)	P value
Subjective sleep quality			
Very good	-	-	
Fairly good	39.3	46.65 (13.5)	<0.001 ^{a*}
Fairly bad	26.2	52.55 (11.04)	
Very bad	34.5	70.6 (14.08)	
Sleep efficiency			
> 85%	58.1	49.7 (14.6)	<0.001 ^{a*}
75-84%	16.4	59.6 (16.9)	
65-74%	10.7	68.38 (7.4)	
<65%	14.8	74.06 (13.6)	
Daytime dysfunction			
Never	17.7	59.77 (20.05)	<0.001 ^{a*}
< 1 times per week	25.8	51.13 (13.07)	
1-2 times per week	35.5	54.12 (15.8)	
≥3 times per week	21	70.3 (14.3)	
Sleep disturbances			
0	-	-	<0.001 ^{a*}
1-9	34.2	45.38 (13.37)	
10-18	55	59.75 (14.84)	
19-27	10.8	74.76 (13.7)	
Sleep duration (h)			
>7	11.3	50 (17.35)	<0.001 ^{a*}
6-7	18.5	51.19 (15.55)	
5-6	34.7	58.5 (12.93)	
<5	35.5	69 (14.61)	
Sleep latency (min)			
<15	2.4	48.85 (15.23)	<0.001 ^{a*}
16-30	8.9	45.55 (13.94)	
31-60	31.5	53.66 (14.63)	
>60	57.2	70.46 (11.99)	
Use of sleeping medications			
Never	13.8	54.88 (16.06)	<0.001 ^{a*}
< 1 times per week	3.4	44.25 (13.5)	
1-2 times per week	25.9	43.65 (9.2)	
≥3 times per week	56.9	64.77 (16.2)	
Overall sleep quality score			
Good	30.7	47.2 (18.5)	0.02 ^{b*}
Poor	69.3	57.48 (17.3)	

^a ANOVA; ^b Independent *t* test; * Statistically significant.

going to bed was higher than 60 minutes. Khorrami-Rad et al., also reported difficulty initiating sleep in women with cancer.⁴ In confirmation of this finding, Kuo et al., reported that the most sleep problems in patients with breast cancer were difficulty initiating sleep.²⁷ Similar studies showed difficulty initiating sleep was more common in people with cancer than healthy people.^{28,29} It

Table 6. Multiple linear regressions of relevant variables as predictors of the fatigue

Variables	Simple linear regression		Multiple linear regression ^a	
	β Standardized coefficients	P value	β Standardized coefficients	P value
Fatigue	0.63	<0.001*	0.54	<0.001*
Age	0.19	0.03*	0.09	0.29
Gender	0.25	0.006*	0.1	0.2
Economic statue	-0.39	<0.001*	-0.14	0.13
Educational level	-0.24	0.007*	-0.17	0.08
Type of cancer	0.12	0.17	-	-
Type of treatment	-0.02	0.79	-	-
Duration of cancer	-0.19	0.03*	-0.21	0.008*

^a R = 0.64, R² = 0.54; *Statistically significant.

seems that the long-term rest and nap during the day are the causes of difficulty initiating sleep in cancer patients.

The mean of sleep duration during the night was nearly 5 hours. Considering that the proper sleep duration is 7-8 hours for adults, nighttime sleep duration in this study was low. In confirmation of this finding, Khorrami-Rad et al., and Lee et al., reported insufficient sleep duration was the one of the major problems in people with cancer.^{4,29} Lack of activity in the hospital causes timely naps during the day and reduces nighttime sleep. Also, the use of corticosteroids (such as dexamethasone) in cancer patients leads to insomnia. These drugs may affect the sleep stages. Huang et al., in their study reported that cortisol-containing diets and their fluctuations in the body are associated with sleep duration, efficiency, latency and daytime dysfunction.³⁰ In current study, the mean sleep quality score decreased with increasing duration of the disease. This reflects the improvement in sleep quality with increasing in the duration of the disease which is consistent with Park et al., study.³¹

The results showed that the mean of fatigue was lower in patients with better sleep quality. The results of a study suggested that the incidence and severity of sleep disorders had a significant relationship with fatigue; also CRF was the strong predictor of sleep quality.³² Beverly et al., recommended that doctors must be treat sleep disorders to relieve cancer related fatigue.³³ In the Loh et al., study, the prevalence of sleep disturbance was 40%. In addition, 63% of cancer patients who had sleep disturbances had CRF. Sleep disorder was associated with pain, fatigue, and depression but after multivariate analysis, only fatigue was significantly associated with the sleep disorder.³⁴ In the Schreier et al., study were moderate correlations among sleep disturbance and fatigue.³⁵

Studies have shown physical activity^{36,37} and cognitive behavioral therapy³⁸ were effective for the management of CRF and sleep disturbance in cancer patients. Lin et al., in their study examined the effect of yoga therapy on CRF and sleep in cancer survivors. They showed yoga therapy

was effective for treating CRF among cancer survivors. In addition, 22% to 37% of the improvements in CRF from yoga therapy result from improvements in sleep quality.¹⁴ Other studies also showed a positive effect of the exercise intervention on improving sleep quality and fatigue. Some studies have also examined the impact of psychological interventions. Gabra and Hashem concluded that sleep disorders and prevalence of some psychiatric disorders such as depression, anxiety, obsession, sensitivity and etc. can disrupt the treatment of cancer patients.³⁹

The limitations of this study are self-completed questionnaires. It is suggested that future studies use of diagnostic tests such as objective measures to confirm sleep disorders and also, assess the impact of interventions on improving fatigue in sleep disorders.

Conclusion

According to the results, there is a relationship between the quality of sleep and fatigue in cancer patients, so patients with better sleep quality had less fatigue. In this study, nearly 70% of patients with cancer had poor sleep quality. Therefore, it is essential to create an environment in which sleep disorder factors are minimized such as reduce noise, turn off lights or reduce the amount of light, set the room temperature, cleanliness of the equipment and the location of the patient's sleep, use the blanket to keep the heat, put the pillows in available place, give the soft and loose clothes to patients, empty the bladder and bowel before sleep, increase fluid and fiber intake during the day and reduce it at night. Doctors can also use sleeping medications to help relieve sleep disorders in cancer patients. Nursing interventions are effective in identifying symptoms. Physical fatigue can be improved by improving physical activity and mental fatigue can be improved by psychosocial interventions.

Research Highlights

What is the current knowledge?

So far, no study in Iran has examined the relationship between sleep quality and fatigue in adults with cancer.

What is new here?

There is a relationship between the quality of sleep and fatigue in cancer patients.

In this study, nearly 70% of patients with cancer had poor sleep quality. In the present study, the mean sleep quality score decreased with increasing duration of the disease. The mean of sleep quality was higher in patients with colorectal cancer and lung cancer than other types of cancer.

The overall sleep quality, sleep latency, daytime dysfunction, sleep efficiency, sleep duration and subjective sleep quality were significantly worse in patients who were treated by all three methods (chemotherapy, radiotherapy, surgery) than patients who received other treatments methods.

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Ethical Issues

Before completing the questionnaire, researchers explained the aim of the study to participants. In addition, participation in the study was voluntary. This article has a license from the research ethics committees of Shahid Sadoughi University of Medical Sciences (Reference number: IR.SSU.SPH.REC.1394.114).

Conflict of Interest

The authors declare that there is no conflict of interest.

Authors' Contributions

MM: Conception and design; FF, MM: Acquisition of data; HF: Analysis and interpretation of data; MM, HF, FF, MM: Drafting the article; MM, HF, FF, MM: Review of article and final approval.

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