

## Evaluation of Sleep Training Effectiveness on the Quality of Sleep in Cancer Patients during Chemotherapy

### Abstract

**Background:** Sleep disorder is one of the most common problems in cancer patients involved in chemotherapy stages, which is caused by the side effects of anticancer drugs and the exacerbation of mental disorders. The aim of this study was to evaluate the effectiveness of sleep health education on sleep quality of cancer patients during chemotherapy stages. **Materials and Methods:** In this clinical trial, 70 cancer patients were selected in the chemotherapy phase and divided into two groups of 35. In the intervention group, two 60-min training sessions on sleep hygiene were educated, solutions of coping with the exacerbation of sleep disturbances were determined, and routine care was provided in the control group. Patients were evaluated for sleep disorders before and 1 and 3 weeks after the intervention by the Pittsburgh questionnaire and then the effect of this intervention compared between the two groups. **Results:** The mean score of sleep medication consumption in the intervention group was not significantly different between the three times ( $P = 0.59$ ), but the mean score of total sleep quality disorder and its other dimensions was significantly different between the three time points ( $P < 0.05$ ). Least significant difference *post hoc* test showed that the mean total score of sleep quality disorder and its dimensions except using sleep medication 1 week after the intervention was significantly less than before the intervention and 3 weeks after the intervention  $< 1$  week after the intervention in the intervention group ( $P < 0.05$ ). **Conclusion:** Sleep health education for cancer patients involved in chemotherapy can significantly have a positive effect on improving their sleep quality.

**Keywords:** Cancer, chemotherapy, health education, quality of sleep

### Introduction

Uncontrolled cell growth leads to a mass creation that is called cancer.<sup>[1]</sup> Many researches have been done on the causes of cancer and increasing its prevalence with population growth.<sup>[2]</sup> Currently, it is estimated that more than 215,000 new cases of cancer patients in the United States in 2015 and about 40,000 deaths have been attributed due to its malignancy.<sup>[3]</sup> In Iran, cancer is the third cause of mortality after cardiovascular disease and accidents.<sup>[4]</sup> The psychological effects of cancer diagnosis and the physical effects of its treatments lead to many side effects that negatively affect a person's quality of life.<sup>[5]</sup> The presence of pain, constant fatigue, nausea, vomiting, anorexia, diarrhea, anemia, shortness of breath, decreased libido, and other physical problems that follow the side effects of various and sometimes simultaneous treatments in cancer threatens

their quality of life. In the process of cancer, in addition to the involvement of the body and the weakening of physical strength and ability, the patient becomes mentally and socially vulnerable. Research has shown that cancer patients have a lower quality of sleep.<sup>[6-11]</sup> Sleep is affected by mental and physical health. Pain, depression, limited daily activities, and reduced quality of life in cancer patients are destructive factors in reducing the quality of their sleep.<sup>[9]</sup> Recent studies suggest that lethal immune cell activity is reduced with sleep deprivation because sleep protects a certain immune system that is important to overcome cancer.<sup>[12]</sup> Sleep is one of the vital and daily human needs that are essential for maintaining energy, physical appearance, and well-being, and human health is directly related to the quantity and quality of sleep.<sup>[13]</sup> Proper quality sleep can be defined as a regenerative sleep period that meets individual sleeping needs and allows people to perform well on a daily basis.<sup>[14]</sup> A person with proper sleep quality sleeps comfortably

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in bed, wakes up slowly, continues to sleep without interruption, and restarts sleep, and there are no changes to his sleep mechanism.<sup>[15]</sup> Sleep quality is influenced by demographic criteria (such as age, race, and gender) and lifestyle factors (e.g., healthy behaviors of sleep and physical activity).<sup>[16]</sup> Studies examining the positive effects of sleep health education suppose that sleep education can improve sleep quality in individuals. One study has shown that ways to improve sleep quality and informing people about it can positively influence their sleep quality indices.<sup>[13]</sup> One part of sleep that can be corrected is sleep hygiene.<sup>[17]</sup> Common and basic treatment of any type of sleep disorder is directly related to sleep health education.<sup>[18]</sup> Sleep hygiene training is part of the behavioral therapy method. The main objective of behavioral techniques used in the treatment of insomnia is to change behaviors that exacerbate sleep disorders. Sleep hygiene means doing things to support the normal rhythm of sleep and wakefulness and promote restful sleep.<sup>[19]</sup> Positive sleep-enhancing behaviors include appropriate behaviors such as sleeping alone in a quiet environment, maintaining a regular sleep and exercise schedule,<sup>[16]</sup> and sleep inhibitory behaviors contain activities such as smoking, alcohol and caffeine consumption before bed, and heavy exercise before bed.<sup>[15]</sup> While researches on these factors have focused on adults with cancer until today, few studies have been conducted in Iran on sleep quality and sleep health behaviors to improve the quality of life in cancer patients.<sup>[20]</sup> Aside from changes in sleep patterns and wakefulness and sleep health behaviors during the cancer progression, these changes are also observed during chemotherapy periods.<sup>[14]</sup> Ross *et al.* have shown that the implementation of training programs for cancer patients leads to improved well-being and particularly better sleep quality.<sup>[21]</sup> Since changes in sleep and wake patterns are more common during chemotherapy courses, changing lifestyle habits and proper sleep hygiene behaviors affect the sleep pattern and ultimately the better quality of treatment. Moreover, fewer studies have been performed on the effect of sleep hygiene training on the quality of sleep of cancer patients during chemotherapy courses. The aim of this study is to determine the effect of sleep health education on sleep quality of cancer patients during chemotherapy process in clinics of Isfahan.

## Materials and Methods

This study is a randomized controlled clinical trial that was approved with ethics code IR.MUI.MED.REC.1398.24 in the Ethics Committee of Isfahan University of Medical Sciences. This study with IRCT20190730044379N1 registration code was conducted in 2019. Samples were taken from cancer patients who were referred to an outpatient clinic affiliated to Isfahan University of Medical Sciences during chemotherapy periods. Inclusion criteria were willingness to participate in the study, age range of 18–65 years, literacy, lack of mental disorders, such as

psychosis, bipolar disorder and schizophrenia, depression, anxiety disorders, or known sleep disorders, Pittsburgh questionnaire score of at least 5, cancer diagnosed by an oncologist, and undergoing chemotherapy. In addition, the occurrence of crisis or unforeseen incident for the patient during the study, failure to participate in at least one training session, and more than 20% defect in completing the questionnaires were considered as exclusion criteria. The required sample size for the study was acquired according to sample size formula to compare means with 95% confidence level, 80% test power, and standard deviation (SD) of sleep quality score of about 17.1.<sup>[22]</sup> The least significant difference (LSD) between the intervention and the control groups was considered 0.8, and according to the formula parameters, the sample size of 32 people was estimated in each group. The procedure was so that first 100 patients were selected from among those undergoing chemotherapy, and of these 100 patients, 70 were selected by convenience sampling method, randomly assigned by SPSS software with random allocation method, to two groups of intervention and control with each one having 35 members [Figure 1]. Before the study, demographic data of both the groups including age, occupation, gender, marital status, and type of cancer were collected in both the groups and sleep quality of both the groups was investigated with the Pittsburgh Sleep Quality Index (PSQI). The questionnaire was refilled by participants in both the groups before, 1 week, and 3 weeks after the intervention. The Sleep Quality Assessment Tool was the Pittsburgh questionnaire. It is a self-report questionnaire that surveys individuals' sleep quality over the past month. The questionnaire has 9 questions, but since the fifth question has 10 subitems, therefore the questionnaire has 18 questions and consists of 7 components: the subjective quality of sleep, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medications, and daytime dysfunction. The score for each question is between 0 and 3, which can be interpreted as follows:

- Lack of sleep problem: Score 0, medium sleep problem: Score 1, serious sleep problem: Score 2, and very serious sleep problem: Score 3. The total score ranges from 0 to 21. The higher the score, the lower the quality of sleep, which is true for each component as well as the total score. A score of 0–5 is considered as desirable sleep quality, and earning a total score above 5 on the whole questionnaire indicates poor sleep quality.<sup>[23]</sup> Farahi *et al.* reported Cronbach's alpha of 0.89 for the Persian version of this questionnaire.<sup>[24]</sup> The intervention group was then given two 60-min training sessions using a lecture, group discussion, question and answer, face-to-face training, and educational pamphlets by a psychologist and a physician
- Session 1: Familiarization and encouragement of cooperation, familiarity with management and control methods, explaining the importance of sleep and introducing therapies and expressing educational

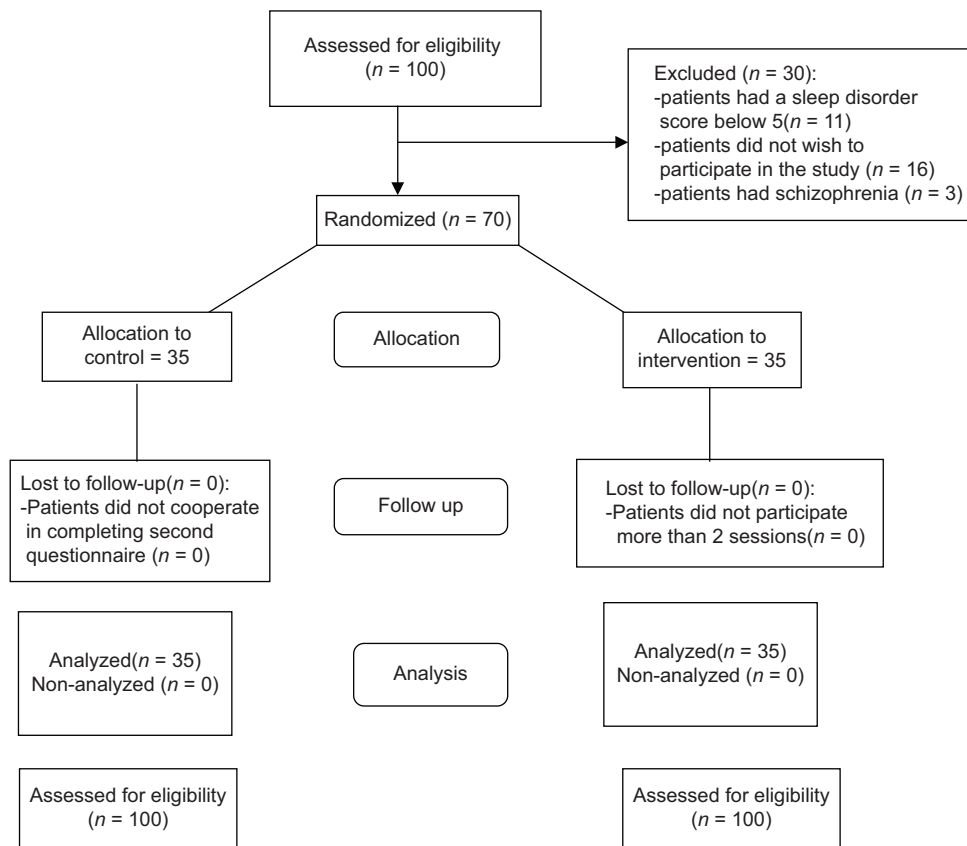


Figure 1: Algorithm of the results of sleep health education in cancer patients receiving chemotherapy

purposes, sleep health training and explaining its components including training on the effect of medication, sleep environment (light, sound, and heat), and lifestyle (exercise, smoking, etc.) on quality sleep

- Session 2: Supportive therapy;<sup>[25]</sup> improving the adaptive beliefs and attitudes about sleep;<sup>[26]</sup> identifying sleep problems; sleep hygiene advice;<sup>[25]</sup> methods to increase sleep time; specifying incorrect behavior patterns associated with sleep; description of stress and its management; cognitive behavioral therapy including sleep restriction, stimulus control, cognitive therapy, sleep hygiene education, sleep scheduling, and relaxation training;<sup>[26-30]</sup> self-help materials such as pamphlets and audio-cassettes;<sup>[27-29]</sup> muscle relaxation training;<sup>[31]</sup> and guided imagery.<sup>[32]</sup>

The control group also received routine educational and caring programs. One week and 3 weeks after the intervention, sleep quality questionnaire was completed by the study groups. Results of patients' sleep quality analysis were compared before the program, 1 week after the intervention, and 3 weeks after the intervention. After completion of the study, the educational content was provided as a pamphlet and CD to the control group.

The study data were finally entered into SPSS software version 24 (IBM company, New York city, America) and analyzed using statistical tests such as Chi-square, *t*-test,

*t*-paired, and variance analysis with repeated observations. The significance level was considered 0.05.

## Results

This study was conducted to investigate the effect of sleep hygiene training on the quality of sleep of cancer patients during chemotherapy courses. Patients ranged in age from 23 to 65 years in the experimental group and 24–61 years in the control group.

The mean age of patients in the experimental and control groups was  $52.1 \pm 12.04$  and  $52.5 \pm 10.3$ , respectively (mean  $\pm$  SD). Independent *t*-test showed that there was no significant difference between the mean age of the two groups ( $P = 0.87$ ) [Table 1].

The frequency distribution of the two groups was completely similar in terms of baseline variables. In both the groups, 16 patients (45.7%) were male and 19 patients (54.3%) were female and all individuals were married. Chi-square test showed that the frequency distribution of occupation ( $P = 0.84$ ) and the type of cancer ( $P = 0.87$ ) were not significantly different between the two groups.

Before the intervention, the mean total score in the experimental and control groups was  $8.89 \pm 3.44$  and  $8.71 \pm 3.10$ , respectively (mean  $\pm$  SD). Independent *t*-test

showed that there was no significant difference between the two groups in the mean total score of sleep quality and its dimensions before the intervention ( $P > 0.05$ ).  $P$  value of total score was 0.83.

Independent  $t$ -test showed that 1 week after the intervention the mean score of subjective sleep quality disorder in the intervention group was significantly lower than the control group ( $P = 0.04$ ), but in the mean of the total score of sleep quality disorder and its other dimensions between the two groups, there was no significant difference ( $P > 0.05$ ).  $P$  value of total score was 0.07.

Independent  $t$ -test showed that there was no significant difference between the two groups in the mean score of sleep medication consumption 3 weeks after the intervention ( $P = 0.91$ ), but the mean score of total sleep quality disorder and its other dimensions (the subjective quality of sleep, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, and daytime dysfunction) in the intervention group was significantly lower than the control group ( $P < 0.05$ ).

Repeated measures ANOVA showed that in the intervention group, the mean score of using sleep medication was not significantly different between the three times ( $P = 0.59$ ), but the mean score of total sleep quality disorder and its other dimensions was significantly different between the three time points ( $P < 0.05$ ). LSD *post hoc* test showed that in the intervention group, the mean total score of sleep quality disorder and its dimensions except using sleep medication 1 week after the intervention was significantly less than before the intervention and 3 weeks after the intervention  $<1$  week after the intervention ( $P < 0.05$ ) [Table 2].

Repeated measures ANOVA showed that in the control group, the mean total score of sleep quality disorder and its dimensions was not significantly different between the three time points ( $P > 0.05$ ) [Table 3 and Figure 2].

### Discussion

Mental problems, especially sleep disorders, are serious problems for cancer patients, which are caused by physical and mental problems due to cancer. Therefore, efforts to improve the sleep quality of cancer patients are important priorities. In this regard, the present study aimed to determine the effect of sleep health education on sleep quality of cancer patients during chemotherapy. The findings of our study showed that educational interventions have led to improved sleep quality disorder and its other dimensions including subjective sleep quality disorder, sleep latency, sleep disturbance, habitual sleep efficiency, sleep disturbances, and daytime dysfunction between the three time points, but there was no improvement in using sleep medication. In a study of cancer patients, Berger *et al.* concluded that sleep disturbance is a common complication in cancer patients, and the use of sedative and sleep medications has no significant effect on improving sleep quality of patients, while psychological support has a significant effect on improving sleep quality of these patients.<sup>[14]</sup> In a study of two Italian and American populations, LeBourgeois *et al.* showed that there was a significant relationship between good sleep hygiene, awareness of sleep hygiene, quality of sleep, and the development of sleep health training led to improved

**Table 1: Frequency distribution of gender, occupation, and type of cancer in two groups**

Variable	Test, n (%)	Control, n (%)	P
Gender			
Male	16 (45.7)	16 (45.7)	1
Female	19 (54.3)	19 (54.3)	
Occupation			
Office employee	8 (22.9)	8 (22.9)	0.84
Worker	3 (8.6)	1 (2.9)	
Homemaker	14 (40)	17 (48.6)	
Unemployed	1 (2.9)	1 (2.9)	
Retired	9 (25.9)	8 (22.8)	
Cancer type			
Ovarian cancer	4 (11.4)	3 (8.6)	0.87
Breast cancer	6 (17.1)	7 (20)	
Stomach cancer	7 (20)	5 (14.3)	
Colon cancer	6 (17.2)	4 (11/4)	
Lung cancer	3 (8.6)	2 (5.7)	
Lymphoma cancer	7 (20)	12 (34.3)	
Prostate cancer	2 (5.7)	2 (5.7)	

**Table 2: Mean total score of sleep quality disorder and its dimensions in the intervention group over three time points**

Dimensions of sleep quality disorder	Mean±SD			P
	Before intervention	One week after intervention	Three weeks after intervention	
Total score	8.89±3.44	7.09±3.34	4.31±2.64	<0.001
Subjective sleep quality	1.29±0.52	0.86±0.60	0.20±0.07	<0.001
Sleep latency	1.49±1.24	1.14±0.21	0.63±0.18	<0.001
Sleep duration	1.43±1.04	1.11±0.99	0.66±0.14	<0.001
Habitual sleep efficiency	1.91±1.17	1.63±1.11	0.94±0.15	<0.001
Sleep disturbances	1.31±0.58	1.09±0.70	0.83±0.12	<0.001
Use of sleep medication	0.71±0.21	0.69±0.20	0.69±0.18	0.59
Daytime dysfunction	0.74±0.20	0.57±0.16	0.37±0.12	0.01

SD: Standard deviation

sleep quality and reduced prevalence of this disorder in the population.<sup>[15]</sup> Javadi and Ghorbani also revealed that mindfulness-based cognitive therapy can improve the four fields of subjective quality, sleep duration, sleep latency, and sleep disturbances and in general sleep quality in women with generalized anxiety.<sup>[33]</sup> The results of this study were consistent with our findings. Tikotzky and Sadehalso found that cognitive-behavioral training courses were effective on sleep components such as reduced sleep latency and wakefulness as well as total sleep quality.<sup>[34]</sup> Furihatta *et al.* and Vallieres *et al.* also emphasized the importance of appropriate sleep interventions to improve the quality of sleep and subsequently the general health of individuals.<sup>[35,36]</sup> Taheri *et al.* showed that sleep hygiene education was effective on the sleep quality and general health of elderly women with sleep disorder.<sup>[37]</sup> Bonnet and Arand showed that sleep hygiene training (cognitive therapy, sleep health training, sleep behavior models, description of stress, and its management methods) was effective on the components of sleep disturbances, the use of sleeping medications, and daytime dysfunction. Sleep health training generally pursues two goals: first, to increase the patient’s knowledge about the effects of sleep habits and environmental factors affecting sleep, and second, to enhance better sleep health practices.<sup>[38]</sup> Improvements in the use of sleeping medications were inconsistent with our results, which may be due to the different study groups. Furthermore, cancer patients

change their medications only with the advice of their doctor, and they are afraid of stopping or taking drugs arbitrarily. The results of Edinger and Sampson’s study showed that cognitive-behavioral therapy increased sleep quality and improved sleep latency and the use of sleeping medications.<sup>[29]</sup> Ozgoli *et al.* showed that health interventions in postmenopausal women have improved the quality of sleep and all its components, including the use of hypnotics.<sup>[39]</sup> These two studies were inconsistent with our study. Finally, in a study by KhorramiRaad *et al.* conducted on breast cancer patients undergoing chemotherapy in Qom, 11.25% of patients had good sleep quality. Furthermore, waking up late at night, sleep latency, and taking sedatives were the most common sleep problems in the patients.<sup>[40]</sup> Ross *et al.* showed that implementing training programs for cancer patients leads to improved well-being and particularly better sleep quality.<sup>[21]</sup> Zengin and Aylaz (2019) studied on “The effects of sleep hygiene education and reflexology on sleep quality and fatigue in patients receiving chemotherapy.” They planned to determine the effects of sleep hygiene education and reflexology on sleep quality and fatigue in the patients receiving chemotherapy. They concluded that the patients receiving chemotherapy had lower mean scores from the PSQI and the Fatigue Severity Scale while they had increased sleep quality and decreased fatigue after sleep hygiene education and reflexology.<sup>[41]</sup>

Papadopoulos *et al.* (2019) studied on “Psychological correlates of sleep quality in lung cancer patients under chemotherapy: A single-center cross-sectional study.” They aimed to clarify the extent to which psychological symptoms, coping strategies, and social support interfere with sleep quality and whether they mediate the relationship between sleep quality and fatigue or functional capacity in a sample of chemotherapy-treated lung cancer patients. They concluded that a higher psychological burden predicts sleep disturbances and contributes to increased fatigue in lung cancer patients undergoing chemotherapy. Effective psychoeducational interventions may benefit these populations.<sup>[42]</sup>

In the end, we faced limitations and weaknesses, such as having physical symptoms and complications from chemotherapy, lack of support and cooperation from

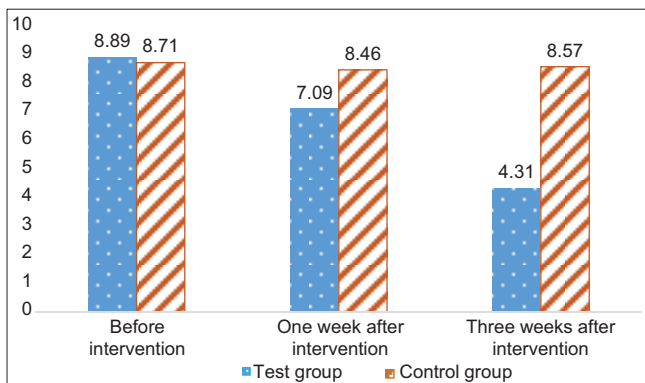


Figure 2: Mean total score of sleep quality disorder in the two groups over three time periods

Table 3: Mean total score of sleep quality disorder and its dimensions in the control group over three time points

Dimensions of sleep quality disorder	Mean±SD			P
	Before intervention	1 week after intervention	3 weeks after intervention	
Total score	8.71±3.10	8.49±3.01	8.57±3.08	0.45
Subjective sleep quality	1.20±0.72	1.17±0.66	1.14±0.11	0.79
Sleep latency	1.51±1.36	1.40±0.23	1.43±0.23	0.28
Sleep duration	1.34±1.33	1.37±1.30	1.37±0.22	0.32
Habitual sleep efficiency	1.89±1.28	1.86±1.29	1.83±0.22	0.80
Sleep disturbances	1.34±0.68	1.23±0.60	1.20±0.22	0.30
Use of sleep medication	0.60±0.19	0.57±0.17	0.66±0.12	0.51
Daytime dysfunction	0.83±0.19	0.89±0.20	0.94±0.21	0.78

SD: Standard deviation

the families of cancer patients, and the impossibility of long-term monitoring of patients.

## Conclusion

According to the findings of the present study, it seems that sleep health education for cancer patients undergoing chemotherapy can have a positive effect on improving their sleep quality. In this regard, informing patients about the side effects of chemotherapy on sleep disorder and understanding this position by patients, that they will have a better quality of life after the chemotherapy phase, also, training on how to cope with the aggravating factors of sleep disorder and more importantly, empathy with patients can have beneficial effects on patients' sleep quality during the chemotherapy phase.

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## Conflicts of interest

There are no conflicts of interest.

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