Northwestern Med J. 2022;2(3):168-176
doi: 10.54307/NWMJ.2022.20592

Original Article

Investigation of sleep quality according to physical activity levels in individuals with lung cancer

Akciğer kanserli bireylerde fiziksel aktivite düzeylerine göre uyku kalitesinin incelenmesi

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Atıf/Cite as: Özsarı E, Özel A, Konuk S, Tütün Yümin E. Investigation of sleep quality according to physical activity levels in individuals with lung cancer. Northwestern Med J. 2022;2(3):168-176.

ABSTRACT

Introduction: Lung cancer is a type of cancer that is usually diagnosed late and has a low life expectancy due to its incidence, high mortality, and initial asymptomatic course. Sleep disorders and related fatigue are common complaints for cancer patients. This study aims to examine sleep quality according to physical activity levels in individuals with lung cancer.

Methods: This study was carried out between December 2021 and March 2022. Individuals diagnosed with lung cancer in Bolu Abant İzzet Baysal University Faculty of Medicine Chest Diseases Outpatient Clinic were retrospectively analyzed. 100 individuals were included in the study. Individuals diagnosed with lung cancer in the chest diseases department of a tertiary care center were retrospectively analyzed. Physical activity level with the International Physical Activity Questionnaire; sleep quality with the Pittsburg Sleep Quality Index; dyspnea with Modified Medical Research Council Scale; performance status with Eastern Cooperative Oncology Group; functional disability with Karnofsky Performance Status; Pain was evaluated with a numerical rating scale.

Results: 52.0% of the individuals included in the study were sedentary. There was no difference between the two groups in terms of mean age (p=0.123), body mass index (p=0.157), disease duration (p=0.342), and length of hospital stay (p=0.273). There was a difference between the two groups in terms of Eastern Cooperative Oncology Group (p=0.001), Karnofsky Performance Status (p=0.001), and total score of Pittsburg Sleep Quality Index (p=0.001).

Conclusion: In our study, it was found that the total sleep quality score of the physically active group was better than the sedentary group. Physical activity is a modifiable lifestyle behavior with positive physiological and psychological health consequences and a potential non-pharmacological intervention for poor sleep quality.

Keywords: Sleep quality, physical activity, activities of daily living, performance status, functional status

ÖZ

Giriş: Akciğer kanseri, insidansı, yüksek mortalitesi ve başlangıçtaki asemptomatik seyri nedeniyle genellikle geç teşhis edilen ve yaşam beklentisi düşük olan bir kanser türüdür. Uyku bozuklukları ve buna bağlı yorgunluk kanser hastalarının ortak şikayetleridir. Bu çalışmanın amacı akciğer kanserli bireylerde fiziksel aktivite düzeylerine göre uyku kalitesinin incelemesidir.

Yöntem ve Gereçler: Bu çalışma Aralık 2021-Mart 2022 tarihleri arasında gerçekleştirildi. Bir üçüncü basamak sağlık kuruluşunun göğüs hastalıkları polikliniğinde akciğer kanseri tanısı alan bireyler retrospektif olarak incelendi. Çalışmaya 100 kişi dahil edildi. Bireyler fiziksel aktivite düzeylerine göre iki gruba ayrıldı. Fiziksel aktivite düzeyi Uluslararası Fiziksel Aktivite Anketi ile; uyku kalitesi Pittsburg Uyku Kalitesi İndeksi ile; dispne modifiye Medical Research Council Ölçeği ile; performans durumu Eastern Cooperative Oncology Group ile; fonksiyonel yetersizlik Karnofsky Performans Durumu ile; ağrı, sayısal derecelendirme ölçeği ile değerlendirildi.

Received: 27.07.2022
Accepted: 27.09.2022
Publication date: 01.10.2022

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Bulgular: Çalışmaya alınan bireylerin %52.0'ı sedanterdi. Yaş ortalaması (p=0.123), vücut kitle indeksi (p=0.157), hastalık süresi (p=0.342) ve hastanede kalış süresi (p=0,273) açısından iki grup arasında fark yoktu. Eastern Cooperative Oncology Group (p=0,001), Karnofsky Performans Durumu (p=0,001) ve toplam Pittsburg Uyku Kalitesi İndeksi puanı (p=0,001) açısından iki grup arasında fark vardı.
Sonuç: Çalışmamızda fiziksel olarak aktif olan grubun toplam uyku kalitesi puanının sedanter gruba göre daha iyi olduğu bulunmuştur. Fiziksel aktivite, olumlu fizyolojik ve psikolojik sağlık sonuçları olan ve kötü uyku kalitesi için potansiyel bir farmakolojik olmayan müdahale ile değiştirilebilir bir yaşam tarzı davranışıdır.

Anahtar kelimeler: Uyku kalitesi, fiziksel aktivite, günlük yaşam aktiviteleri, performans durumu, fonksiyonel durum

INTRODUCTION

Lung cancer is a type of cancer that is usually diagnosed late and has a low life expectancy due to its incidence, high mortality, and initial asymptomatic course (1). According to the estimations of newly diagnosed cancer for 2012, the most diagnosed cancer in the world was lung cancer (13.0%), while the most deaths from cancer were caused by lung cancer (19.4%) (2). It is stated that if the rate of cancer continue to increase, there will be a total of 19.3 million new cancer cases in 2025 due to the increase in the world population and the aging of the population (3). The incidence of cancer in Turkey shows similarities with the world and developing countries. According to the data obtained from the database of the Cancer Control Department of the Ministry of Health in Turkey, cancer incidence rates increased from 133.78 per 100 thousand in 2002 to 173.85 per 100 thousand in 2005 (4). The five most common cancer types in Turkey are lung (30.13), prostate (24.33), skin (18.91), breast (17.96), and stomach (9.92) cancers with an incidence of one in 100,000 (4).

The primary symptoms of lung cancer include cough, dyspnea, chest pain, hemoptysis, and sputum (5). In cases with lung cancer, there may be an underlying chronic lung disease or other comorbidities independent of it (6). In addition to comorbidities, it has been reported that patients with lung cancer who have a high smoking habit often have decreased exercise capacity, resting dyspnea, fatigue, restlessness, polyneuropathy, and sleep disturbance (7, 8). Sleep disorders and related fatigue are common complaints for cancer patients. As a result of research, it has been determined that approximately 50% of cancer patients complain of fatigue and insomnia (9, 10). Patients see sleep as an interim period to get away from their complaints such as psychological distress, pain, and fatigue, and to relax. However, the failure to achieve a night of restful sleep and the subsequent sense of normalcy leads to an increase in the patient's stress, and cognition and affect are impaired in insomnia (11). Fatigue is one of the main complaints defined by cancer patients both before and during, and after treatment (12). Cancer-related fatigue is thought to disrupt sleep and sleep-wake rhythms (13). Factors affecting sleep quality in cancer patients are old age, exercise, environmental factors, drugs, alcohol and smoking, psychological/psychiatric problems, and diseases (14-16). A period of inactivity during (and after) cancer treatment can lead to decreased cardiorespiratory fitness, bone loss, muscle atrophy, worsening of glucose metabolism, decreased insulin sensitivity, and worsening of digestive function, which may affect the ability to perform activities of daily living (ADL)(17-20).

One-third of cancer patients have difficulty performing basic activities of daily living. Activities of daily living most commonly affected include walking and transfers, household chores, shopping, and transportation (21). Physical activity has been proposed as a non-pharmacological intervention to combat the physiological and psychological effects of treatment in cancer patients (22). In the literature, there are studies supporting that physical activity and exercise have a key role in cancer rehabilitation (23-25).

This study aims to investigate the sleep quality in individuals with lung cancer and different physical activity levels.

MATERIALS AND METHODS

In this retrospective, cross-sectional study, The International Physical Activity Questionnaire, which evaluates physical activity, was used as the primary parameter for efficiency. To determine the sample size, a priori power analysis was performed in the G power version 3.1.9.7 program. In the power analysis, it was determined that at least forty-five individuals in each group and a total of ninety individuals should be included to reach a significance level of 0.05, an effect size of 0.6, and a power of 80%. Individuals who met the inclusion criteria from the Bolu Abant İzzet Baysal University Medical Faculty Chest Diseases Department's archive were included in the study. The study was approved by Bolu Abant İzzet Baysal University Clinical Research Ethics Committee (Decision no 2021/248). The interviews were performed by telephone call. Inclusion criteria for the study were being older than 18 years of age and having been diagnosed with lung cancer at least 4 weeks ago. Exclusion criteria from the study were severe hearing impairment, illiteracy, a severe physical illness that would impair cooperation, Eastern Cooperative Oncology Group (ECOG) status of three and above, a life expectancy of fewer than 6 months, cognitive impairment, and being treated for mental disorder at the time of the study and needing continuous oxygen support. Information about the physical, sociodemographic, and clinical symptoms were collected using the questionnaire.

Measurements

International Physical Activity Questionnaire (IPAQ): It was developed by Craig in 2003 to determine the physical activity levels of adults (26). The reliability and validity study of this questionnaire was carried out by Sağlam et al. (27). The questionnaire can determine the type of physical activity and time spent by individuals in the last seven days. There are two different versions of the IPAQ, long (27 questions) and short (7 questions). The short form was used in this study. The total score is calculated by multiplying the duration (minutes) and frequency (days) of walking, moderate and vigorous activity. Individuals with a metabolic equivalent score (MET) of less than 600 MET min/week are considered inactive, 600-3000 MET min/week moderately active, and over 3000 kcal/min active (26). In our study, the included individuals were divided into two groups sedentary and non-sedentary individuals according to the International Physical Activity Questionnaire score. Individuals with a metabolic equivalent score of less than 600 MET min/week formed the sedentary group, while individuals with more than 600 MET min/week formed the physically active group.

Pittsburgh Sleep Quality Index (PSQI): PSQI is a 19-item self-report scale that assesses sleep quality and disturbance in the past month. It consists of twenty-four questions: nineteen questions are self-report questions, and five questions are to be answered by the spouse or roommate. The last five questions are not included in the scoring, they are used for clinical evaluation. The 18-point question of the scale consists of seven components that are subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleep medications, and daytime dysfunction. Each component is given a score between 0 and 3. The total score of the seven components gives the total score of the scale, which can range from 0 to 21. A total score greater than 5 means "poor sleep quality" (28). The validation of index for Turkish population was performed by Ağargün et al. in 1995 (29).

Modified Medical Research Council Scale (mMRCS): It is a scale based on various physical activities that cause dyspnea. It consists of five items. The individual chooses the grade that best describes respiratory distress from these five items, the scoring ranges from 0-4 (30).

Eastern Cooperative Oncology Group (ECOG): Performance status is a score that predicts a patient's ability to perform certain activities of daily living without the assistance of others. These activities of daily living include basic activities such as dressing, eating, and bathing, as well as more complex activities such as cleaning the house and doing a regular job. ECOG is a widely used scoring system for the determination of the functional status of cancer patients. This scale ranges from 0 to 4: "0", The patient has no complaints; "1", The patient has a complaint but does not affect his daily life; "2", The patient has a complaint, but spends less than half the day resting; "3", The patient has a complaint, but spends more than half the day resting; "4", The patient has a complaint, he spends the whole day resting. "0" indicates a fully functional and asymptomatic (asymptomatic) patient, and "4" indicates the bedridden status (31).

Karnofsky Performance Status: Karnofsky performance scale was used to rate the functional disability. In this performance scale, scores are given from 0 to 100, scores between 80 and 100 indicate that the patient can maintain their normal activity and does not need special care, and a score between 50-70 is that they are unable to work, can live at home, can fulfill most of their personal needs. A score of 0-40 indicates that he cannot take care of himself and the disease progresses very quickly (32).

Numerical Rating Scale (NRS): NRS uses numbers to assess pain. A defined scale between 0-10 is used and individuals are asked to give a number appropriate to their pain. Zero represents no pain while 10 represents worst pain (33).

Statistical Method

The descriptive values, numbers, and % frequencies were shown in tables as mean and standard deviation. The Kolmogorov-Smirnov test was used to test the normal distribution of variables under investigation. The t-test was used to compare two groups in terms of normally distributed numerical features, and the Mann-Whitney U test was used for group comparisons for non-normally distributed features. The relationship between categorical features and groups were examined by the chi-square test. The statistical significance level was $p<0.05$ and SPSS (ver. 20) program was used in the calculations.

RESULTS

In the study, one hundred individuals with lung cancer aged 42-79 years were included. Of the subjects, 94 (94.0%) were male and 6 (6.0%) were female. 52 (52.0%) of the individuals were sedentary. The mean MET score of the Non-Sedentary Group was 4208,72±4236,94 and the Sedentary Group was 177,62±184,14. There was no difference between the two groups in terms of mean age (p=0.123), body mass index (p=0.157), disease duration (p=0.342), and length of hospital stay (p=0.273) (Table 1).

The baseline descriptives, clinical, and symptom data of the individuals participated in the study are given in Table 2.

Differences were found between the two groups in ECOG (p=0.001), Karnofsky Performance Status (p=0.001), and total PSQI (p=0.001) parameters. However, there was no difference in the NRS (p=0.402) (Table 3).

Table 1. Demographic data.

	Patients		Between-Group Comparison
	Non-Sedentary Group (n=48)	Sedentary Group (n=52)	p
Age (years), mean (SD)	64,5 (7,8)	66,6 (5,8)	0,123 (t=-1,557)
Body mass index (kg/m^2), mean (SD)	26,4 (4,1)	25,1 (5,0)	0,157 (t=-1,427)
Disease duration (months), mean (SD)	20,2 (24,1)	21,2 (21,6)	0,342 (z=-0,950)
Length of hospital stay (days), mean (SD)	7,9 (4,8)	6,9 (4,7)	0,273 (z=-1,096)

**p<0.05 statistically significant difference; t: t-test in independent groups; z: Mann Whitney U test; SD: Standard deviation.*

Table 2. Individuals' work status, cancer stage, histological type, weight loss and mMRCS values.

Characteristics	Patients		Between-Group Comparison
	Non-Sedentary Group (n=48)	Sedentary Group (n=52)	p
Working status			
Full or part time, n (%)	24 (50,0)	7 (13,5)	
Retired, n (%)	16 (33,3)	34 (65,4)	
Leaving work due to illness, n (%)	3 (6,3)	7 (13,5)	
Other, n (%)	5 (10,4)	4 (7,7)	
Has he/she ever smoked?			
Yes, n (%)	44 (91,7)	45 (86,5)	
Pack year, average (SD)	43,9 (14,7)	45,7 (21,2)	0,837 (z=-0,206)
Does he/she use alcohol?			
Yes, n (%)	10 (20,8)	6 (11,5)	
Glass per week, average (SD)	0,9 (0,8)	1,8 (1,1)	0,181 (z=-1,449)
Cancer stage			
Stage 1, n (%)	2 (4,2)	2 (3,8)	
Stage 2, n (%)	2 (4,2)	3 (5,8)	
Stage 3, n (%)	4 (8,3)	4 (7,7)	
Stage 4, n (%)	14 (29,2)	8 (15,4)	
Unknown, n (%)	26 (54,2)	35 (67,3)	
Limited disease, n (%)	2 (4,2)	1 (1,9)	
Common disease, n (%)	11 (22,9)	8 (15,4)	
Unknown, n (%)	35 (72,9)	43 (82,7)	
Histological type			
Adenocarcinoma, n (%)	3 (6,3)	5 (9,6)	
Squamous cell, n (%)	27 (56,3)	33 (63,5)	
Large cell, n (%)	2 (4,2)	1 (1,9)	
Small cell, n (%)	15 (31,3)	10 (19,2)	
Other, n (%)	1 (2,1)	1 (1,9)	
Unknown, n (%)	-	1 (1,9)	
Weight loss			
No, n (%)	25 (52,1)	21 (40,4)	
<5, n (%)	11 (22,9)	12 (23,1)	
>5, n (%)	4 (8,3)	15 (28,8)	
Unknown, n (%)	8 (16,7)	4 (7,7)	
mMRCS			
0, n (%)	11 (22,9)	2 (3,8)	
1, n (%)	33 (68,8)	22 (42,3)	
2, n (%)	4 (8,3)	27 (51,9)	
3, n (%)	-	-	
4, n (%)	-	1 (1,9)	

**p<0.05 statistically significant difference; z: Mann Whitney U test; SD: Standard deviation; mMRCS: Modified Medical Research Council Scale.*

Table 3. Functional status, pain level and sleep quality of individuals.

Characteristics	Patients		Between-Group Comparison
	Non-Sedentary Group (n=48)	Sedentary Group (n=52)	p
ECOG, mean (SD)	1,04 (0,68)	1,69 (0,75)	0,001 (z=-3,880)
Karnofsky, mean (SD)	87,91 (6,82)	81,73 (9,64)	0,001 (z=-3,497)
NRS (0-10), mean (SD)	2,25 (3,13)	1,92 (2,90)	0,402 (z=-0,839)
Pittsburgh Sleep Quality Index (PSQI)			
Subjective sleep quality (0-3), mean (SD)	0,83 (0,69)	1,44 (0,60)	0,001 (z=-4,187)
Sleep latency (0-3), mean (SD)	1,38 (0,64)	1,75 (0,71)	0,004 (z=-2,861)
Sleep duration (0-3), mean (SD)	0,46 (0,74)	0,25 (0,51)	0,179 (z=-0,874)
Sleep efficiency (0-3), mean (SD)	1,44 (1,23)	1,63 (1,26)	0,382 (z=-0,874)
Sleep disturbance (0-3), mean (SD)	1,25 (0,52)	1,79 (0,63)	0,001 (z=-4,294)
Use of sleep medications (0-3), mean (SD)	0,31 (0,74)	0,21 (0,53)	0,750 (z=-0,319)
Daytime dysfunction (0-3), mean (SD)	0,83 (0,99)	1,42 (0,93)	0,001 (z=-3,269)
Total PSQI (0-21), mean (SD)	6,50 (3,14)	8,50 (2,65)	0,001 (z=-3,295)

**p<0.05 statistically significant difference; z: Mann Whitney U test; SD: Standard deviation; ECOG: Eastern Cooperative Oncology Group; NRS: Numerical rating scale.*

DISCUSSION

We noted that the physically sedentary group had worse sleep quality than the non-sedentary group. Physical activity is a modifiable lifestyle behavior with positive physiological and psychological health consequences and a potential non-pharmacological intervention for poor sleep quality (34, 35). Physical activities that can be done in the hospital environment are limited. Prolongation of hospital stay may cause a decrease in the average weekly physical activity level. Whelan et al. reported that low-intensity physical activity level was associated with the length of hospital stay in individuals with cancer (36).

After the diagnosis of lung cancer, the physical activity level of the patients often decreases the functionality, sleep quality, activities of daily living, and quality of life are adversely affected (37-39). A moderate level of physical activity is beneficial in alleviating the symptoms of individuals and improving their independence in daily living activities (40).

In conjunction with an increase in physical activity level, the risk of lung cancer decreases by 20-30% in women and 20-50% in men (41). It has been reported that individuals with cancer walk an average of 5103 steps per day, and an increase of 1000 steps per day is associated with a 38% reduction in the risk of hospitalization (42). In our study, the performance status and functional disability of the sedentary group were worse than the non-sedentary group. Granger et al. reported in their study that individuals with small cell lung cancer were in worse physical condition at diagnosis than healthy individuals and were able to walk an average of 78 meters less (19% reduction) on the 6-minute walk test over the next six months (38). Jones et al. reported a 13% reduction in the risk of death from metastatic lung cancer for every 50 m increase in the 6-minute walk test (43).

In our study, that the sleep quality of the physically active group was better than the sedentary group. Physical exercise has been shown to improve sleep quality in cancer survivors. It has been reported that sleep quality improved after 4 weeks in breast cancer patients who did walking exercise for 20 minutes a day, four times a week, and received hormonal therapy (44). In another study, individuals diagnosed with cancer participated in a supervised exercise program 2 days a week for 12 weeks over the next 2 years. The exercise program consisted of walking on the treadmill, climbing stairs, and upper body exercises; all of which became increasingly challenging as patients adjusted. As a result of the study, it was reported that sleep

problems decreased significantly in individuals who participated in the exercise program (45).

A previous study reported that 58% of prostate and breast cancer survivors did routine exercise after treatment (46). Pinto et al. reported that 33% of women treated for breast cancer lead a sedentary life after treatment (47).

In our study, the sleep quality of the sedentary group was worse than the non-sedentary group, which is consistent with the literature. Decreased sleep quality is a common effect of cancer and its treatments have been linked to many causes such as pain, depression, and anxiety (48-50).

The effects of chemotherapy and radiation treatments received by individuals may also be a probable reason for the high sleep quality disorder rates observed in our study.

In our study, the difference in performance status and functional disability parameters observed between the two groups might be due to the different physical activity levels of the individuals. For this reason, we think that the evaluation of the physical activity levels of individuals with lung cancer will contribute significantly to the creation of a rehabilitation program that will be planned for the individual (51).

Our study has some limitations. In our study, the relationship between sleep quality and physical activity was considered a one-way relationship. Although physical activity levels in cancer survivors meet the recommendations of the American College of Sports Medicine (ACSM) and the United States Center for Disease Control (CDC) compared with individuals without a history of cancer; there is a need for studies on the effects of physical activity on sleep quality to see whether it differs according to the time after diagnosis.

Ethics Committee Approval: The study protocol was approved by the Bolu Abant İzzet Baysal University Clinical Research Ethics Committee (2021/248 / 26.10.2021).

Conflict of Interest: The authors have declared that they have no conflict of interest.

Funding: The authors have declared that they have not received any financial support.

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