Determining of Fatigue and Sleep Disturbance in Patients with Chronic Obstructive Pulmonary Disease

Kronik Obstrüktif Akciğer Hastalığı Olan Hastalarda Yorgunluk ve Uyku Sorunlarının Belirlenmesi

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ABSTRACT Objective: The purpose of this study was to evaluate the fatigue associated with sleep disturbances, age, gender and secondary disease in patients with chronic obstructive pulmonary disease (COPD). **Material and Methods:** A descriptive and correlational study was conducted on 114 patients hospitalized with COPD diagnosis. Brief Fatigue Inventory and Post-Sleep Inventory were used as data gathering forms. Relationships among fatigue-related interference and sleep disturbance, age, gender, secondary diseases were assessed logistic regression analyses. **Results:** It was observed that patients with COPD suffered from different levels of fatigue. Physical, emotional and social functions were affected by fatigue. 112 patients reported sleep disturbances. There were negative significant relations between fatigue and sleep length. Females experienced more fatigue than males. The daily activity including mood was affected by heart failure. The walking ability was affected by age and heart failure. Enjoyment of life and eating were affected by sleep disturbances. The relations with other people were affected by sleep disturbances, age and gender. **Conclusion:** The enjoyment of life, eating and relations with other people are affected by sleep disturbances in patients with COPD. The sleep disturbances were eliminated to effective fatigue management in patients with COPD. The sleep pattern and fatigue levels must be assessed in patients with COPD by nurse.

Key Words: Pulmonary disease, chronic obstructive; fatigue; sleep disorders

ÖZET Amaç: Bu çalışmanın amacı kronik obstrüktif akciğer hastalığı (KOAH) olan hastalarda yorgunluk ile uyku sorunları, yaş, cinsiyet ve ikincil hastalıkların ilişkisini değerlendirmekti. **Gereç ve Yöntemler:** Çalışma, KOAH tanısı ile hastaneye yatırılan 114 hasta ile tanımlayıcı ve ilişki arayıcı olarak gerçekleştirildi. Veri toplama aracı olarak Kısa Yorgunluk Sorgulama Formu ve Uyku Sonrası Değerlendirme Formu kullanıldı. Yorgunluğun oluşturduğu engeller ile uyku sorunları, yaş, cinsiyet ve ikincil hastalıklar arasındaki ilişkiler lojistik regresyon analizi ile değerlendirildi. **Bulgular:** KOAH'li hastaların farklı düzeylerde yorgunluk yaşadığı, fiziksel, ruhsal ve sosyal fonksiyonların yorgunluktan etkilendiği saptandı. 112 hasta uyku sorunu olduğunu bildirdi. Uyku süresi ve yorgunluk arasında negatif ilişki bulundu. Kadınlar erkeklerden daha fazla yorgunluk deneyimledi. Kalp yetmezliği varlığında ruhsal durum etkilendi. Yürüme kabiliyeti yaş ve kalp yetmezliğinden etkilendi. Yemek yeme ve yaşam sevinci uyku sorunlarından etkilendi. Diğer kişilerle ilişkiler uyku sorunları, yaş ve cinsiyetten etkilendi. **Sonuç:** KOAH'li hastalarda diğer kişilerle ilişkiler, yemek yeme ve yaşam sevinci uyku sorunlarından etkilenmektedir. KOAH'li hastalarda etkili yorgunluk yönetimi için uyku sorunları giderilmelidir. KOAH'li hastaların uyku düzenleri ve yorgunluk düzeyleri hemşire tarafından değerlendirilmelidir.

Anahtar Kelimeler: Kronik obstrüktif akciğer hastalığı, yorgunluk, uyku sorunları

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Chronic obstructive pulmonary disease (COPD), a diagnosis devised and accepted by clinicians, refers to a constellation of clinical and pathologic findings that, individually or in combination, produce

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chronic airflow obstruction, disability, and sometimes, death. The diagnosis usually refers to the presence of chronic obstructive bronchitis associated with varying degrees of emphysema and bronchospasm (asthmatic bronchitis).[1,2] One symptom which has been identified as a major problem for individuals with COPD is fatigue.[3,4] Although dyspnea generally is considered the most prominent symptom of COPD and individuals with COPD report that fatigue occurs with near equal frequency.[3] A strong positive relationship has been demonstrated between dyspnea and fatigue.[5]

Fatigue is a complex, multifactor phenomenon that has proven difficult to define, measure, and treat. It is usually short-lived and often relieved by a good night's sleep.[6] Fatigue often accompanies or precedes most major illnesses and treatments.[6,7] Several factors that naturally exist are influential on fatigue: the production of metabolites, changes in the energy and in the enzymes that produce energy, activity/rest patterns, sleep/wake patterns, social status, and the way of life, psychological status, environmental factors, diseases and their treatments.[6] As for COPD, fatigue is due to several factors, including declines in tissue oxygenation, infection, sleep disturbances, stress, and side effects of some drugs, nutritional disorders and obesity.[8]

Patients with COPD may hypoventilation not simply because of impaired ventilator mechanics but also reduced respiratory capacity, which can be inherent or secondary to a coexisting metabolic alcholosis. The disturbances in arterial blood gases are typically magnified during sleep because of a further reduction in central respiratory capacity. The resulting increased nocturnal hypercapnia may cause cerebral vasodilatations leading to morning headache; sleep quality also may be severely impaired, resulting in morning fatigue, daytime somnolence, mental confusion, and intellectual impairment.[7]

Sleep has well-recognized effects on breathing, including changes in central respiratory control, airways resistance, and muscular contractility, which do not have an adverse effect in healthy individuals but may cause problems in patients with COPD.[9] It has been shown that the drop in oxygen saturation during sleep is twice as important as that observed during maximal exercise.[10] Non-rapid eye movement (NREM) sleep is associated with relative autonomic stability and functional coordination between respiration and cardiac functions. The respiratory muscles are controlled by central neural systems that are influenced by feedback from chemical and mechanical sensors. NREM sleep, there occurs a regular pattern of breathing with more pronounced hypoventilation than during drowsiness. This hypoventilation seems to result from a combination of decreased ventilatory capacity and a sleep-related defective compensation for an increased upper airway resistance. Hypoxemia equal to or greater than that during NREM sleep seems mainly to result from hypoventilation.[11]

Mild to moderate sleep-disordered breathing is associated with reduced vitality, while severe sleep-disordered breathing is more broadly associated with poorer quality of life. Symptoms of sleep disturbance are comprehensively associated with poorer quality of life.[12] Haughney et al. found that the attributes of exacerbations considered most important were impact on everyday life, need for medical care, number of future attacks and breathlessness, sleep disturbance and impact on mood.[13] Many drugs can be cause of sleep disturbance. Beta-2 antagonists and anticholinergics may lead to tremor, unease, tachycardia, sleep disturbance and muscle cramps.[1,14] Sleep could be disrupted by restricted positioning, pain and discomfort, anxiety and fear, and poorly coordinated nurse-patient activities.[15] Sleep hygiene addresses practices such as an excessive intake of caffeine, vigorous exercise near bedtime, daytime napping, and sleeping in an uncomfortable environment, that are inconsistent with good sleep.[16]

Studies on sleep disturbance among the general population have found that lack of sleep is significantly associated with reported fatigue.[17] Dyspnea and fatigue both had moderate negative correlations with functional performance, while sleep difficulty had no significant negative correlation with functional performance.[18]

A review of the literature shows that patients with COPD suffer from fatigue and sleep disturbance. Research is needed to investigate relationship between fatigue and sleep disturbance in patients with COPD. The purpose of this study was to evaluate the fatigue associated with sleep disturbances, age, gender and secondary disease in subjects with chronic obstructive pulmonary disease.

MATERIAL AND METHOD

STUDY POPULATION

The study is a descriptive and correlational survey. Participants were selected according to the following criteria; had been hospitalized to treatment of COPD, over 18 years, able to speak and read Turkish, did not have communicational problems and serious dsypnea, did not take hypnotics or minor tranquilizers for sleep problems. The eligible patients who agreed to participate in the study were administered the questionnaire packet. 185 patients with COPD were hospitalized in Training and Research Government Hospital from October 2004 to March 2005. Of 185 patients with COPD available to enter the longitudinal study, 71 patients did not meet inclusion criteria. The study was conducted with 114 patients hospitalized in Training and Research Government Hospital due to COPD. The mentioned hospital accepts patients of various social-cultural groups and admits all sorts of health insurance. The hospital, therefore, is able to reflect the profile of Turkish COPD patients. Taking into consideration the boosting periods of COPD, namely spring and winter, the study was carried out between the dates October 2004 and March 2005.

DATA COLLECTION

Patient Identification Form, Post-Sleep Inventory (PSI), and Brief Fatigue Inventory (BFI) were used in the data gathering. In face-to-face interviews, The PSI and the BFI forms were filled by the patients. Data was obtained from patients with COPD who were clinically stabile and did not have serious dyspnea and anxiety at the time.

Patient identification Form includes social-demographic characteristics (age, gender, marital status, diagnosis and secondary disease), habits such as smoking cigarette and drinking alcohol. Daily sleep time was determined according to patient's self-expression.

The Brief Fatigue Inventory (BFI): The BFI was developed by the Department of Symptom Research to measure and describe fatigue in cancer population in 1999.[19] Validity and reliability of BFI for Turkish version was tested by Cinar et al. on chronic hemodialysis patients and Azak et al. on patients with lymphoma, and yielded a Cronbach's-alpha value of 0.98.[20,21] In the present study, cronbach's alpha coefficient for the BFI scale was 0.97. The BFI was used to assess the severity of fatigue and the amount of interference with function caused by fatigue in this study. The BFI has 9 items that were designed to provide a measure of fatigue. Three items in the BFI ask patients to rate their fatigue during the past 24 hours at its "worst," "usual" or "average," and "now," with "0" being "no fatigue," and "10" being "fatigue as bad as you can imagine." Additional items assess how much fatigue has interfered with different aspects of the patient's life during the past 24 hours. The interference items included in the present study were mood, daily activity, walking ability, eating, relations with other people and enjoyment of life. Each interference item is scored on an eleven point rating scale from "0" (does not interfere) to "10" (completely interferes). A mean BFI score is calculated as the mean of the intensity and interference items.

The Post-sleep inventory (PSI): The PSI was developed by Webb et al. to permit an adequate description of subjective responses to a preceding period of sleep.[22] Validity and reliability of the PSI for Turkish version was tested by Cinar et al. on chronic hemodialysis patients. Reliability coefficients for the PSI were 0.92-0.95.[23] In the present study, cronbach's alpha coefficient for the PSI scale was 0.91. The PSI consisted of a questionnaire with three groups of opposing statements separated by an analogical "0" to "10" rating scale. The aim was to classify the patient's understanding about his/her sleep quality in terms of feelings at bedtime (score PSI 1), quality of nocturnal sleep (score PSI 2), and feelings at awakening (score PSI 3). A total score

(PSI 4) was also arrived at as follows: (PSI 1+ PSI 2+ PSI 3) ÷ 3. To interpret the PSI scores a score of "0" reflects a positive opinion about the patient's sleep quality, while a score of "10" reflects a very negative opinion.[22]

PROTOCOL

Approval to conduct the study was obtained from director of hospital. The patients were, at first, given information on the study and questionnaire. The study was initiated upon receiving the approval and consent form of the planned participants.

DATA ANALYSIS

Statistical evaluation of the data was performed via Statistical Package for Social Sciences (SPSS) software on computers; Social-demographic characteristics, fatigue and sleep disturbances were examined using percentage. Fatigue and sleep disturbance levels and the fatigue-related interference were examined using arithmetic averages and standard deviation (SD). Relationships among fatigue-related interference and sleep disturbance, age, gender, secondary diseases were assessed logistic regression analyses.

TABLE 1: Sosyo-demographic characteristics of patients with COPD (N=114)

	n	%
Gender		
Female	44	38.6
Male	70	61.4
Age Groups		
35-44	5	4.4
45-54	17	14.9
55-64	43	37.8
65-74	38	33.3
75 and above	11	9.6
Marital Status		
Married	74	64.9
Single	40	35.1
Disease		
Chronic Bronchitis	49	55.9
Emphysema	23	26.2
Chronic Bronchitis and Emphysema	42	47.9
Secondary Disease		
Diabetes Mellitus	21	18.4
Hypertension	16	14.0
Heart Failure	32	28.1
Osteoarthritis	16	14.0
None	44	38.5

RESULTS

The descriptive characteristics of the patients with COPD in the study were presented in Table 1. Of the 114 patients with COPD, 38.6% (n= 44) were females, 61.4% (n= 70) were males. According to age groups; 4.4% (n=5) of the patients were 35-44 years, 14.9% (n=17) were 45-54 years, 37.7% (n=43) were 55-64 years, 33.3% (n=38) were 65-74 years, and 9.6% (n=11) were 75 and above year. Forty-eight percent of the patients were diagnosed with both chronic bronchitis and emphysema. Fifty-six percent of the patients were diagnosed with chronic bronchitis and 26% with emphysema. Of the patients, 28.1% had heart failure and 18.4% had diabetes mellitus.

None of the patients have taken caffeine and alcohol and smoked cigarette as long as patients were in hospital. Fatigue severity was presented in Table 2. High levels of fatigue were reported by 97% of the patients (n= 111); perceived fatigue (during the past 24 hours at its worst, usual and now). All patients suffered from fatigue and their physical, emotional and social activities were affected by fatigue. Daily activity, walking ability, mood, eating, enjoinment of life and relations with other people were affected by fatigue.

Daily total sleep was 5.2 ± 2.1 hours in average. Two percent of the patients did not have any sleep disturbance, while 98% (n= 112) of the patients defined sleep disturbances. Sleep disturbances were mostly related to bedtime (having difficulty falling asleep) 98% (n= 112), 97% (n= 111) awakening (wakening up too early in the morning), and 96% (n= 109) nocturnal sleep (waking up during the night). Sleep disturbance scores were presented in Table 2. This overall score was the mean of the sum of the scores on the three sleep items: wakening up too early in the morning, wak-

TABLE 2: Fatigue levels, fatigue-related interference and sleep disturbance (N=114)

Fatigue and influenced activity, sleep disturbances	Mean ± SD	(min. – max.)	Median
Fatigue worst	8.9 ± 1.3	(3 - 10)	9.0
Fatigue usual	7.1 ± 1.5	(3 - 10)	7.0
Fatigue now	7.4 ± 1.6	(2 - 10)	8.0
Daily activity	7.1 ± 2.1	(2 - 10)	8.0
Mood	6.9 ± 2.3	(1 - 10)	7.0
Walking ability	7.2 ± 2.5	(1 - 10)	8.0
Eating	7.6 ± 2.3	(2 - 10)	8.0
Relations with other people	5.7 ± 2.5	(1 - 10)	6.0
Enjoyment of life	6.2 ± 2.7	(1 - 10)	7.0
Total fatigue score	64.1 ± 14.9	(26 - 88)	67.0
Bedtime	7.0 ± 2.3	(2 - 11)	7.0
Awakening	5.8 ± 2.1	(1 - 9)	6.0
Nocturnal sleep	4.6 ± 2.6	(1 - 9)	5.0
Mean sleep disturbances score	5.8 ± 2.3	(2 - 11)	6.0

ing up during the night and having difficulty falling asleep.

A negative significant correlation was defined between sleep disturbances and daily sleep time ($r=-0.401$, $p<0.001$). In addition to, there were negative significant relations between fatigue and sleep length ($r= -0.446$, $p<0.001$).

Relationships among fatigue-related interference and sleep disturbance (TSD), age, gender, secondary diseases were presented in Table 3. Fatigue-related interference taken as the dependent variant, scores were categorized as below and above 5, and a logistic model was developed also using independent variants-sleep disturbances, age, gender and secondary disease. Multivariable logistic regression analyses revealed that daily activity were associated with female gender. The possibility of the scores to be 5 and above was 6.0 times bigger in females than males. These analyses explained that heart failure affected on mood. The possibility of the scores to be 5 and above was 3.4 times bigger in those with heart failure than patients did not have heart failure. These analyses revealed that walking ability were associated with age and heart failure as secondary disease. The possibility of the scores to be 5 and above was 53.8 times bigger in those above the age of 55, 7.4 times bigger in those with heart failure than others. The variant that explained the influence on eating was sleep disturbances, and the possibility of the influence on work to be 5 and above was 3.2 times bigger in those with sleep disturbances.

Logistic regression analyses revealed that relations with other people were associated with sleep disturbance, age and female gender. The possibility of the scores to be 5 and above was 27.8 times bigger in females, 5.6 times in those of ages 55 and

TABLE 3: Relationships among fatigue-related interference and sleep disturbance (TSD), age, gender, secondary diseases (N=114).

Activities	TSD score (95:0% CI) Lower-Upper OR and p	Age (95:0% CI) Lower-Upper OR and p	Gender (95:0% CI) Lower-Upper OR and p	Heart deficiency (95:0% CI) Lower-Upper OR and p
Daily activity	-	-	1.21 – 30.23 6.039 **0.029***	-
Mood	-	-	-	1.04 - 11.21 3.410 **0.043***
Walking ability	-	6.14 – 472.15 53.844 **0.000*****	-	1.17 - 47.30 7.443 **0.033***
Eating	1.04 - 9.98 3.226 **0.042***	-	-	-
Relations with other people	1.32 - 11.64 3.919 **0.014***	1.55 - 20.59 5.651 0.009**	5.75 – 135.11 27.880 0.000***	-
Enjoyment of life	1.05 - 10.14 3.259 **0.041***	-	-	-

Note: OR: Odds ratio, *p<0.05, **p<0.01, ****p<0.001.

above, 3.9 times in those with sleep disturbances. Finally, Influences on the enjoyment of life were 3.2 times likelier in those with sleep disturbances (see Table 3).

DISCUSSION

In the present study we observed that 97% of the patients experienced high levels of fatigue. Theander and Unosson, expressed that almost half of the patients with COPD (47%), reported fatigue every day during the preceding month compared with 13% of the control group.[24] Tel, reported that 100% (n= 43) of patients with COPD experienced fatigue.[25] These findings are supported in our present study findings.

In this study, the most affected aspects in patients with COPD were defined to be physical activities such as daily activities, walking ability, eating and mood. Activity was more susceptible to fatigue as oxygen levels in tissues decrease related with COPD. On the other hand, less influence was noted in mood, enjoyment of life and relations with other people. That familial relationships and friendship in Turkish culture are relatively stronger and that the patients are accompanied by a relative throughout hospitalization may be influential on this finding. The assessment of activities affected by fatigue in relation with sleep disturbances, age, gender, presence of heart failure that "daily activities" were more susceptible to effects in women; "mood" in those with heart failure; and that "walking ability" in elders and in those with heart failure. "Eating" was more likely to be affected in those with sleep disturbances; "relations with other people" in those with sleep disturbances, in females, elders, and "enjoyment of life" was more likely to be affected to sleep disturbances. Sleep disturbances, older age and presence of heart failure are significant predictors of fatigue for patients with COPD.

Theander and Unosson, observed that the patients with COPD reported greater impact of fatigue on cognitive, physical and psychosocial functioning than the control group.[24] Kapella et al. found that the patients with COPD reported moderate amounts of fatigue, and dyspnea, depressed mood, and sleep quality accounted for 42% of the variance in subjective fatigue. Patients with COPD frequently show symptoms such as dyspnea and fatigue, which lead to functional impairment and disability. Fatigue, dyspnea, airflow obstruction, and anxious mood accounted for 36% of the variance in functional performance.[26] Breslin et al, in their study on 41 patients with COPD, reported that fatigue was one of the important symptoms and that exercise capacity was the most affected aspect.[27] Fatigue had mental effects on patients of all patient groups. The reasons for the high prevalence of severe fatigue among the patients with COPD are not clear because the small size in the patient may limit the generalization of findings to a broader population of patients with COPD.

In this study, we found that the mean total sleep time of the patients was 5.2 ± 2.1 hours, with 98% of the patients experiencing sleep disturbances. From these findings it was derived that patients with COPD could not have enough sleep, their sleep frequently disturbed, they felt physically bad after waking up, and that they woke up with a poor psychological status, and they experienced difficulties in falling asleep. None of the patients have taken caffeine and alcohol and smoked cigarette as long as patients were hospitalized. All of the patients had hard breathing and 43% of the patients were older age and 81% of the COPD patients were over 55 years. It is considered that hard breathing due to COPD, older age, hospitalization and changes in the environment can cause sleep disturbances. Tel, observed that 93% of the patients with COPD (n= 40) experienced sleep disturbances due to their medical conditions.[25] In the related literature, it is defined that insufficient sleep might cause several psychological symptoms including fatigue, irritability, concentration difficulties, confusion and personality alterations even in healthy people after 3-4 days.[15] Sleep disturbances are among the factors that lead to an increased level of fatigue.[28] On the other hand, Reishtein, found that dyspnea and fatigue both had moderate negative correlations with functional performance, while sleep difficulty had no significant negative correlation with functional performance.[18]

We found that fatigue levels increased as the daily sleep time decreased. "Eating", "relations with other people" and "enjoyment of life" were more likely to be affected to sleep disturbances. Grady et al. defined that fatigue was related not to the amount or quality of a sleep.[6] Studies on sleep disturbance among the general population have found that lack of sleep is significantly associated with reported fatigue.[17] Dyspnea and fatigue both had moderate negative correlations with functional performance, while sleep difficulty had a small no significant negative correlation with functional performance.[18] Anderson et al. impressed that the fatigue and interference ratings of the cancer patients and the community subjects were significantly associated with the total sleep disturbance score although the majority of the psychiatric patients reported sleep disturbance, their seep disturbance scores were not significantly associated with fatigue severity.[19] These findings are supported in our present study findings.

CONCLUSION

This study shows that sleep disturbances and fatigue are important problems in patients with COPD. However, sleep disturbances, older age are significant predictors of fatigue for patients with COPD. For an effective fatigue management, it is suggested to eliminate the sleep disturbances in patients with COPD.

Some limitations are evident in our study. The small size in the patient may limit the generalization of findings to a broader population of patients with COPD. We did not identify what we can do to get rid of fatigue and sleep disturbances. Thus, future studies with a large sample size could be useful for validation purpose. Research is needed to understand the relationship of fatigue and sleep disturbances. Understanding this relationship should guide the development of more effective treatment strategies for fatigue and sleep disturbances.

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