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Research Article

Assessment of Sleep-associated Symptoms in Chronic Obstructive Pulmonary Patients via Stop and Berlin Sleep Questionnaires

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Abstract

Introduction and Objective: Chronic obstructive pulmonary disease (COPD) is a multisystem disease which is an important cause of morbidity and mortality world-wide and its prevalence is increasing rapidly. Sleep-related disorders, especially obstructive sleep apnea syndrome (OSAS), are more common in patients with COPD. OSAS is a sleep-related respiratory disorder characterized with apnea, hypopnea, airway contraction, decreased oxyhemoglobin saturation and hypercapnia. OSAS affects many individuals world-wide and accompanies diseases as well as COPD. Key questions for OSAS such as snoring, apnea, daytime sleepiness, hypertension, and obesity are questioned in STOP and Berlin questionnaires. In our study, we aimed to determine the risk for OSAS in patients with COPD using Stop and Berlin sleep questionnaires.

Methods: We performed this study on totally 106 subjects. COPD patients were grouped as emphysema (n = 84) and chronic bronchitis (n = 22). Sleep apnea symptoms of all patients were questioned using the Stop and Berlin sleep questionnaires.

Results: Stop survey risk score was 47.6% lower and 45.2% higher in patients with emphysema. In the chronic bronchitis group, it was 18.2% and 72.7%, respectively. There is a significant difference between two groups in terms of stop survey risk score (χ^2 = 6.645; df = 2; p = 0.03). The Berlin questionnaire score was 57.1% lower and 35.7% higher in patients with emphysema; and it was found to be 22.7% lower and 68.2% higher in chronic bronchitis group. There is a significant difference between the emphysema and chronic bronchitis groups in terms of the risk score of the Berlin questionnaire (χ^2 = 8.766; df = 2; p = 0.01).

Conclusion: In conclusion, sleep surveys are simple and easily accessible methods that can be applied in physicians daily-practice to evaluate patients who have high risk for OSAS.

Keywords: *Chronic Obstructive Pulmonary Disease (COPD); Obstructive Sleep Apnea Syndrome (OSAS); Stop Questionnaire; Berlin Questionnaire*

Introduction

Chronic obstructive pulmonary disease (COPD) is a multisystem disease which is an important cause of morbidity and mortality world-wide and its prevalence is increasing rapidly. This disease is characterized by exaggerated inflammatory responses of lung parenchyma and irreversible airway obstruction [1,2]. In literature, sleep-related disorders, especially obstructive sleep apnea syndrome (OSAS), are more common in patients with COPD and sleep quality deteriorates due to decreased oxygen saturation, hypercapnia and non-use of auxiliary respiratory muscles in COPD patients [3].

OSAS is a sleep-related respiratory disorder characterized with apnea, hypopnea, airway contraction, decreased oxyhemoglobin saturation and hypercapnia [4]. OSAS affects many individuals worldwide and accompanies diseases as well as COPD [3]. It is known that OSAS induces oxidative stress and related diseases. Additionally, OSAS can cause co-morbidities such as cardiovascular diseases which increase morbidity and mortality related with OSAS [5].

Stop and Berlin questionnaires, which question sleep-related symptoms to assess OSAS risk, play an important role as a screening method in COPD patients. The STOP questionnaire is defined as a practical and decisive survey to determine the risk of OSAS. Persons who respond to two or more questions in the STOP questionnaire can be classified as persons with OSAS risk [6]. The Berlin sleep questionnaire is a questionnaire consisting of 13 questions and used in the diagnosis of OSAS. Key questions for OSAS such as snoring, apnea, daytime sleepiness, hypertension, and obesity are questioned in these questionnaires. In our study, we aimed to determine the risk for OSAS in patients with COPD using Stop and Berlin sleep questionnaires.

Materials and Methods

Patients and questionnaire

We performed this study on totally 106 subjects. All subjects were treated at the Department of Thoracic Medicine, Kutahya Health Sciences University, Kütahya, Turkey. COPD patients were grouped as emphysema (n = 84) and chronic bronchitis (n = 22). The diagnosis of COPD was established on the basis of criteria proposed by Global Initiative for Chronic Obstructive Lung Disease (GOLD) [7]. Sleep apnea symptoms of all patients were questioned using the Stop and Berlin sleep questionnaires. All of the procedures were explained to the subjects and written informed consent forms were obtained from all participants.

Statistical analysis

Statistical analyses were done by SPSS (Statistical Package for Social Sciences, Chicago, IL, USA) 16.0 package program. The Chi-square test was used to analyze results of Stop and Berlin questionnaires. All P values < 0.05 were accepted as statistically significant.

Results

Some demographic characteristics and clinical properties of patient population are given by table 1 and 2. The mean age of the all patients was 67 ± 11 years old and the mean weight was 69 ± 16 kg. 94.3% of the all patients were male and 5.7% were female. 44.3% of patients had an additional disease and 53.8% of patients had no additional disease. 78.3% of patients had emphysema, 19.8% had chronic bronchitis. 1.9% of the patients could not be diagnosed (n = 2). Additionally, it has been found that 38.7% of patients had drug use, 59.4% had no medication. It has been observed that 61.3% of the patients were hospitalized and 38.7% had no hospitalization in the last 1 year. 91.5% of all patients were active-smoker, 8.5% of all patients were ex-smoker. 56.6% of the all patient population had GOLD stage4. It has been determined that 72.6% had mMRC grade 1 of patient population.

		n	%
Gender	Male	100	94.3
	Female	6	5.7
Diagnosis	Emphysema	84	79.2
	Chronic bronchitis	22	20.8
Medication	Exist	41	38.7
	Not exist	63	59.4
Hospitalization	Yes	65	61.3
	No	41	38.7
Smoking	Yes	97	91.5
	No	9	8.5
GOLD Stage	A	7	6.6
	B	19	17.9
	C	5	4.7
	D	60	56.6

Table 1: *Demographic characteristics of the patient population.*

	n	Mean ± SD	Minimum Value	Maximum Value
Age	105	67,36 ± 10,63	24,00	87,00
Weight (kg)	104	69,22 ± 16,57	38,00	125,00
Length (m)	104	1,66 ± 0,007	142,00	180,00
BMI	104	27,07 ± 22,32	14,33	243,75
FVC (ml)	91	1830,33 ± 790,06	540,00	5370,00
FVC (%)	91	50,52 ± 20,08	16,00	116,00
FEV1 (ml)	91	1227,12 ± 591,08	440,00	3570,00
FEV1 (%)	91	45,05 ± 20,24	14,00	99,00
FEV1/FVC	91	67,21 ± 16,94	38,00	100,00
CAT point	106	22,43 ± 10,15	,00	40,00

Table 2: *Clinical properties of patient population.*

The Stop questionnaire risk score had been found 41.5% low score and 50.9% high score in the whole patient population. The risk score of the Berlin Questionnaire had been found 50.0% low score and 42.5% high score in the whole patient population.

When we compared the group of emphysema and chronic bronchitis, we obtained the following results. 96.4% male and 3.6% female in emphysema group; In the chronic bronchitis group, 86.4% were female and 13.6% were female. There is no significant difference between the groups of emphysema and chronic bronchitis in terms of gender. In the emphysema group, there is 40.5% additional disease, 58.3% no additional disease; while in the chronic bronchitis group there is 59.1% additional disease and 36.4% do not have any additional disease. There is no significant difference between the emphysema and chronic bronchitis groups in terms of additional disease.

In the emphysema group, 36.9% of the patients had medication while 61.9% had no medication. In the chronic bronchitis group, while 45.5% of the patients had medication, 50.0% had no medication. There is no significant difference in use of drugs between emphysema and chronic bronchitis groups. The hospitalization was 61.9% in the emphysema group and 38.1% had no hospitalization in the last one year. In the chronic bronchitis group, 59.1% had hospitalization and 40.9% had no hospitalization in the last one year. There is no significant difference in hospitalization between emphysema and chronic bronchitis groups in the last year. Smoking rate was 94% in patients with emphysema and 81.8% in chronic bronchitis group. There is no significant difference between the groups in terms of smoking rate. According to the GOLD criteria, Stage 1 airway obstruction was the highest in both groups. Stage 3 airway obstruction was more frequent in the chronic bronchitis group and stage 4 airway obstruction was more frequent in the emphysema group. 57.1% of patients with emphysema and 54.5% of the patients with chronic bronchitis were categorized as stage D COPD according to GOLD staging and stage B is higher in emphysema group. There is no significant difference between two groups in terms of GOLD and also mMRC staging.

Stop survey risk score was 47.6% lower and 45.2% higher in patients with emphysema. In the chronic bronchitis group, it was 18.2% and 72.7%, respectively. There is a significant difference between two groups in terms of stop survey risk score ($\chi^2 = 6.645$; df = 2; p = 0.03) (Table 3). The Berlin questionnaire score was 57.1% lower and 35.7% higher in patients with emphysema; and it was found to be 22.7% lower and 68.2% higher in chronic bronchitis group. There is a significant difference between the emphysema and chronic bronchitis groups in terms of the risk score of the Berlin questionnaire ($\chi^2 = 8.766$; df = 2; p = 0.01) (Table 3).

	Emphysema		Chronic bronchitis	
	n	%	n	%
Risk Score				
Stop Questionnaire				
Low	40	47.6	4	18.2
High	38	45.2	16	72.7
$\chi^2 = 6.645$; df = 2; p = 0.03				
Berlin Questionnaire				
Low	48	57.1	5	22.7
High	30	35.7	15	68.2
$\chi^2 = 8.766$; df = 2; p = 0.01				

Table 3: *Comparison of Stop and Berlin questionneries in COPD patients.*

Discussion

COPD is defined by irreversible symptoms associated with continuous airway obstruction. It is considered as a preventable and treatable disease worldwide [1,2]. OSAS is a disease characterized by partial or complete intermittent collapse of the upper airway. In general, it causes hypoxemic stimuli in night sleep [8]. It is stated that the ratio of OSAS cases, which are defined as mild to severe, is 26% and even higher in adults in the world [9]. Cases of coexistence of COPD and OSAS have been described by Flenley as overlap syndrome [10]. There are studies showing the presence of OSAS between 10% and 66% in patients with COPD [11-14]. Mortality and morbidity increased if OSAS was not treated in such cases [15].

Risk factors such as age, gender or neck circumference were found to be different among populations in the diagnosis of COPD patients with OSAS [4]. Although polysomnography (PSG) is accepted as the gold standard for OSAS diagnosis, it is expensive, time-consuming and needs trained personnel [16]. In literature, it is recommended to reserve PSG for selected cases [17,18].

Therefore, different models need to be developed. Screening surveys are simple, cost-effective and easy to implement, making them a good alternative. Thus, in our study, we evaluated sleep-related symptoms in patients with COPD by Stop and Berlin questionnaires in order to determine individuals who have high-risk for OSAS.

Today it is known that OSAS has bidirectional interactions with obstructive lung diseases (OLD) like COPD and asthma. Most studies reported that OSAS is more frequently seen in patients with COPD. And it is stated that this is a result of shared risk factors, for both OSAS and COPD, like obesity, smoking, increased airway resistance and also local and systemic inflammation [19]. In literature, it is also reported that Overlap syndrome, coexistence of COPD and OSAS, is more frequent in chronic bronchitis type than emphysema type [20]. In the light of literature, when we look at our results, we see that Stop and Berlin Questionnaire risk score is higher in chronic bronchitis type than emphysema type. So compatible with the literature, we can interpret that Overlap syndrome risk is higher in chronic bronchitis group as expected.

Up to now, multiple risk factors have been identified for OSAS including obesity, neck circumference, smoking, alcohol consumption and multiple comorbidities including cardiovascular diseases [21]. Furthermore, gender is another risk factor which makes men vulnerable to sleep apnea [22]. In our study, OSAS risk was found to be higher in obese individuals with chronic bronchitis. Additionally, smoking rate was similar in two groups but OSAS risk was higher in chronic bronchitis group who are active smoker. Also, OSAS risk was found to be higher in males with chronic bronchitis. Based on our findings, we can comment that results of OSAS risk evaluation with STOP and Berlin Questionnaires is compatible with the literature.

On the other hand, there are some limitations of our study. The major limitation of the study is having no apparent gold standard procedure that the patients can be compared with. For example, we evaluated our study group with questionnaire. Since, PSG is time-consuming, we could not perform PSG in our daily-practice to confirm the diagnosis of OSAS and Overlap Syndrome in the study population. Additionally, in all study groups, the female subjects are low. This point can affect the generalizability of our study. The subject group includes both patients on medication and those who are not. It may change the applicability of the results.

Conclusions

In conclusion, sleep surveys are simple and easily accessible methods that can be applied in physicians daily-practice to evaluate patients who have high risk for OSAS. In this respect, they can be the previous step before PSG as time-saving methods in order to determine patients who will undergo PSG.

Conflict of Interest

The authors declare that they have no conflict of interest.

Financial Disclosure

None.

Informed Consent

All of the procedures were explained to the subjects and written informed consent forms were obtained from all participants.

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