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EFFECTS OF ACTIVE/PASSIVE SMOKING EXPOSURE IN PATIENTS WITH COPD

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Abstract

Objectives: Smoke exposure of COPD (Chronic Obstructive Pulmonary Disease) patients increases the frequency of exacerbations and affects the quality of life. However, most patients still continue to active/passive smoking exposure after being diagnosed with COPD. In this study, the effects of active/passive smoking exposure on symptoms exacerbation/pulmonary functions in COPD patients were investigated.

Materials and Methods: Totally 151 COPD patients were included in the study. Patient data on active/passive smoking exposure and exacerbation frequency, and COPD Assessment Test (CAT), modified Medical Research Council dyspnea scale (m-MRC), and pulmonary function tests (PFT) were recorded. As well as active smoking exposure, these parameters were especially evaluated in ex-smoker COPD patients according to passive smoking exposure. The data were evaluated in SPSS 22.0 program; X^2 and student t-tests were applied.

Results: Active/passive exposure was determined (26.49% and 43.05%, respectively). Total cigarette consumption was 1.5 times higher in men, and passive smoking exposure (69.56%) was higher in women. In addition, it was determined that the m-MRC score increased statistically significantly as exposure to passive cigarettes increased. It was observed that the number of exacerbations increased in ex-smoker COPD patients with passive exposure. Another finding in the study; was determined that the increase in each standard deviation in cigarette consumption caused a 19% decrease in pulmonary function capacity and an increase in m-MRC, CAT scores.

Conclusion: Active/passive smoking exposure was detected in most COPD patients. It was determined that continuous smoking exposure in patients caused an increase in the number of exacerbations and a deterioration in the quality of life. Therefore, it is necessary to increase awareness of passive smoking exposure in the management of COPD patients.

Keywords: COPD, smoking exposure, exacerbations.

Introduction

COPD is a common, persistent, and preventable dysfunction of the lung associated with limitation in airflow. COPD is a complex disease associated with abnormalities of the airway, which is predominantly caused by exposure to noxious gases and particulates over a long period.[1] The global prevalence of COPD was 251 million cases in 2016, and the death rate was 5% (3.17 million) alone in 2015. Until 2060, it has been reported that deaths annually from COPD and related conditions may be over 5.4 million by GOLD2020(Global Initiative for Chronic Obstructive Lung Disease).[2] COPD is ranked by the WHO as the third leading cause of death, especially with a particular burden in low and middle-income countries.[2,3] This burden is predicted to grow due mainly to increased global exposure to tobacco due to poor awareness.[4] It is known that the main factor for COPD is smoking. However, active/passive smoking exposure continues even after being diagnosed with COPD is a reality for many patients. This exposure hinders the treatment and control of exacerbation and affects the quality of life.[5] It is important to reduce exacerbations in COPD, and the most important cause of exacerbation is exposure to cigarette smoke. Passive smoking exposure, as well as active exposure to cigarette smoke, causes exacerbation.[6,7] However, the harmful effect of passive exposure in COPD and the level of the health results are not fully known. It has not been shown whether passive smoking exposure is an additional risk in active smokers COPD patients.[8] Although the possible contribution to the incidence of COPD is stated, the lack of evidence in passive exposure has been noted in the GOLD report.[2] There are limited studies that passive exposure adversely affects the quality of life, shortness of breath, and COPD exacerbation.[8] There is also a growing awareness of the adverse health consequences of passive smoking exposure in COPD.[9-13] In addition, it has also been reported that chemicals in passive exposure may differ from primary smoke, even for active smokers.[8] The effects of active smoking in COPD are investigated and shown in many studies.[8] However, studies investigating the effects of passive exposure are limited.

In this study, the level of active/passive smoking exposure, and its effects on symptoms, exacerbation/pulmonary functions were investigated in COPD patients.

Materials and Methods

This study was carried out in COPD patients between November-2019/March-2020. A total of 151 volunteer COPD patients diagnosed in the COPD clinic according to the GOLD-2020 criteria were included in the study and followed up within the scope of the Akdeniz University COPD Monitoring Project.[1]

Patients who refused to participate in the study and to follow-up were excluded. In addition, COPD patients were excluded if they have not the according to the GOLD criteria [Forced Expiratory Volume in one second/Forced Expiratory Volume (FEV_1/FVC) > 70%].[1]

Data on socio-demographic characteristics, active-passive smoking exposure, total cigarette consumption, complaints, exacerbation frequency (emergency admission, hospitalization, etc.) were collected. Total cigarette consumption was calculated as "pack/year" .[14] Pulmonary function test (PFT) measurements of the patients were made with the spirometer device. In addition, COPD Assessment Test (CAT) and modified Medical Research Council dyspnea scale (m-MRC)[15] score were applied for the severity of the disease and GOLD classification.

The study was designed to investigate the relationship between total cigarette exposure, active/passive smoking and pulmonary functions, complaints, acute exacerbations (defined as the number of hospital admission and emergency applications) in the last year in COPD patients. Firstly, active and passive smoking exposure rates of COPD patients were determined in the study. Furthermore, m-MRC and CAT scores were compared in current smokers or ex-smokers with COPD patients. In addition, these scores were compared in ex-smoker COPD patients with or without passive exposure.

Exacerbations, defined as the number of hospital admission and emergency applications in the last year, were recorded. It was compared in ex-smokers COPD patients with or without passive exposure. In addition, FEV_1, FVC and Peak End Expiratuar Flow(PEEF) values were compared in ex-smoker COPD patients with or without passive smoking exposure.

Statistical Analysis

The data were evaluated in SPSS 22.0 program. Normal distribution of study data was tested for compliance. In order to describe the qualitative variables, absolute frequencies and percentages were used. The description of quantitative variables was performed using the mean, standard deviation (SD), median. The chi-squared test was used to compare the numerical data, and the Student t-test was used for the comparison of the measurement data with exposure group and without. The results were described with p-values.

Results

Totally 151 COPD patients, 128 men and 23 women were included in the study. The mean age of the patients was 66.15±9.51, and the mean duration passed after COPD diagnosis was seven years. Active smoking was found on average 20 years, and a total cigarette consumption was found as 40.25 packs/year in patients. While total cigarette consumption was 38.71 packs/year in ex-smokers, it was approximately 10% higher in the current smokers (44.35 packs/year). While there was no never-smoker in men, this rate was 21.74% in women patients. The rate of ex-smokers was 75.00% in men, and this rate was 43.48% in women. The rate of current

smokers was higher in women than men (34.78%, 25.00%, respectively). The passive smoking exposure was higher in ex-smokers than current smokers (70.19% and 26.49%, respectively).

While the rate of active smoking exposure of COPD patients was 26.49%, the passive exposure rate was 43.05%. In addition, passive smoking exposure was 38.28% in men; this rate was approximately twice high in women (69.56%, p=0.005) (Figure 1).

Figure 1. Smoking status in patients with COPD by gender

Passive smoking exposure was relatively low (36.79%) in the ex-smokers, but it was observed in more than half of the current smokers (57.50%). So current smokers were more exposed to passive cigarette smoke. The rate of passive smoking exposure at home was 78.26%. It was 4.35% at work and 17.39% both at home and at work.

Table 1. Active/passive smoking status and total cigarette consumption in patients with COPD

			All patients		Passive smoking exposure		p
		Age*	n	%	n	%	
Gender	Women	63.22±8.41	23	15.23	16	69.56	0.005
	Men	66.68±9.63	128	84.76	49	38.28	
	Total	66.15±9.51	151	100	65	43.04	
Smoking status	Current Smokers	61.63±9.35	40	26.49	23	57.50	0.031
	Ex and never smokers	67.78±9.07	111	73.51	42	37.83	

Data are given as mean ± std. deviation.

The passive exposure of current smokers in the study group was 57.50%. Hospital admissions in the last year were higher (26.08%) among current smokers with passive exposure. In the study, the GOLD D class patients rate was 47.82%. (Figure 2).

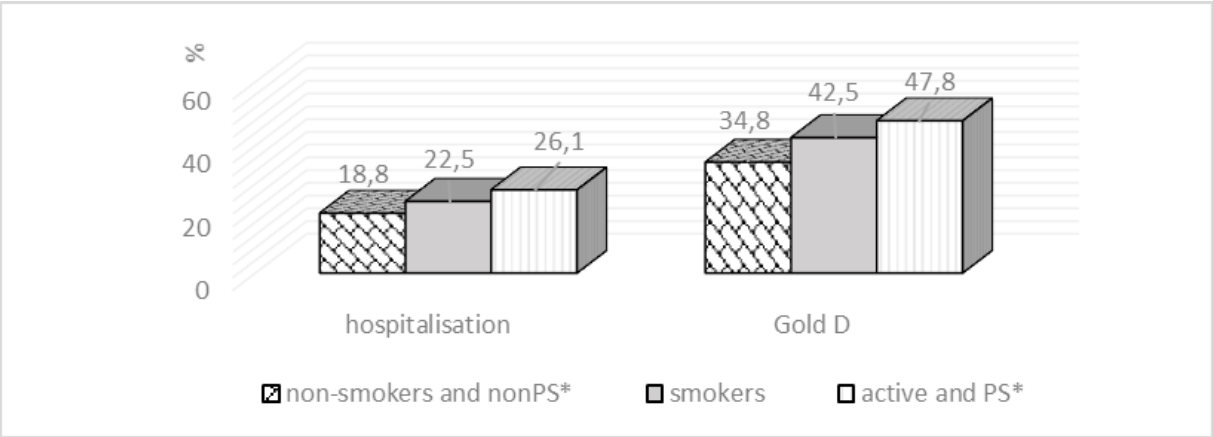

Figure 2. Active and passive smoking exposure rates in hospital admissions and GOLD D COPD patients

In current smokers, the passive smoking exposure rate was 43.05% in the study, and this rate was higher in women than men (69.56% and 38.28%, respectively). Passive smoking exposure of the patients was mostly at home (89.23%). The rate of those who received long-term oxygen therapy was 10.59% in the study. In this group, the passive smoking exposure rate was 43.75%. It was remarkable that the passive smoking exposure rate was 46.42%, even in group D patients.

The effects of passive smoking exposure were investigated among the ex-smokers, which constitutes the largest group, and the results were given in Table 2. Passive exposure was 36.79% in the ex-smokers. That is, one in three COPD patients there was passive smoking exposure even though they were smoking cessation.

The m-MRC CAT scores were evaluated in ex-smoker patients with passive smoking exposed. The m-MRC score was statistically significantly higher in ex-smoker patients with passive smoking than without passive smoking (1.69 and 1.25 respectively, p=0.016), (Table 2). Although those with passive smoking exposure were approximately four years younger, it was noteworthy that the m-MRC score of this group was significantly higher than without exposure group. This data shows that passive smoking exposure affects the dyspnea score. An increase of CAT score was also observed in the presence of passive smoking exposure, but this increase was not statistically significant (12.82 and 10.83 respectively), (p=0.199). In addition, the m-MRC and CAT scores were investigated in current smoker COPD patients. The CAT score was 12,87, and the m-MRC score was 1.67 in this group. These data showed that m-MRC and CAT scores of ex-smoker COPD patients with passive smoking exposure were close to the values of current smokers.

The number of exacerbations was compared in this group. While the number of exacerbations in the last year was 1.21 in the without passive smoking exposure group, it increased to 2.64 in patients with passive smoking exposure group (p=0.021), (Table2). Although those with passive smoking exposure were approximately four years younger, it was noteworthy that the number of exacerbations in the last year was twice as higher than without the passive smoking exposure group. PFT values of ex-smoker COPD patients were compared according to the presence of passive smoking exposure (Table 2). FEV_1 and PEEF values were found to be relatively lower in patients with passive exposure than without passive exposure, but there was no statistical difference (p= 0.574, p=0.103).

Table 2. Effects of the presence of passive smoking exposure in ex-smokers

Ex-smokers (n=106)		**Passive smoking exposure***		p
		No (n=67)	**Yes**(n=39)	
Age		69.13±8.34	65.36±10.28	**0.042**
FEV_1%		53.13± 15.91	51.37±14.69	0.574
FVC%		61.91± 14.43	61.92±15.13	0.998
FEV_1/FVC		61.68± 8.65	60.77±12.29	0.656
PEEF%		56.73± 16.38	51.16±17.55	0.103
m-MRC score		1.25± 0.82	1.69±1.00	**0.016**
CAT score		10.83± 7.12	12.82±8.41	0.199
At last year	Number of hospitalization	0,33± 0.93	0.64±1.32	0.158
	Number of emergency admissions	0.88± 1.93	2.00±3.00	**0.021**
	Number of exacerbations	1.21± 2.54	2.64±3.71	**0.021**

Data are given as mean ± std. deviation.

Discussion

Smoking is known to cause COPD. However, a significant portion of COPD patients continues exposure to smoke. While the rate of patients with COPD who continue exposure to smoke is reported to be 31-49% worldwide, this rate is higher (26% -58%) in developing countries.[16,17] In our study, it was found that one of four COPD patients (26.49%) were current smokers. This rate was lower compared to previous studies, and it was thought to be associated with the success of smoking cessation efforts. When our data was evaluated, it was seen that current smokers in COPD patients were higher in women patients than in men (34.78%, 25.00%, respectively). In other words, one in four men patients and one in three women patients were current smokers after being diagnosed with COPD. Patients receiving long-term oxygen therapy were "heavier" patients, however the rate of current smokers was 25.00% in this group. In other words, tough they were heavier patients could not quit smoking. In studies, it was reported that smoking addiction was higher and smoking cessation success was lower in COPD patients.[18-20] Therefore, specific strategies for smoking cessation should be developed for every current smoker patient after being diagnosed with COPD. One of the main goals of the

AKIZ project was to help COPD patients with smoking cessation. In the initial three-month period, approximately 10% of the smoker COPD patients were smoking cessation.

Although ex-smoker were six years older than current smokers, pulmonary functions (FEV_1% and PEEF%) were higher in ex-smokers. According to the guidelines, "smoking cessation" may equate the rate of decline in respiratory function in COPD patients to physiologically expected levels in non-smokers. Turan et al. reported that a decrease in FEV1 level could be prevented by quitting smoking.[21] In another study, it has been reported that the FEV_1 level increases by 29 ml in the first year after smoking cessation, whereas it decreases by 25 ml in current smokers.[22] In summary, respiratory functions of COPD patients, improve after smoking cessation. Our findings were compatible with the literature.

It has been reported that complaints are decreasing with smoking cessation in COPD patients.[23-25] In one study, it has been reported in current smoker COPD patients that CAT scores decreased from 18.9 to 8.1 six months after smoking cessation.[26] Similarly, m-MRC and CAT scores were lower in ex-smokers than smokers COPD patients in our study (0.26 and 1.31, respectively). The findings in our study were also compatible with the literature.

In the studies carried out, it has been reported that especially severe cases admitted to the hospital for an average of 1.5–2.5 times in last year for COPD attacks.[27] In our study, the annual number of exacerbations was found to be approximately two, and it was consistent with the literature. It has been reported in many studies that smoking is one of the most important factors causing acute exacerbation in patients with COPD. In addition, in the same studies, it has been reported that exacerbations could be prevented by smoking cessation.[22,28] In our study, the number of exacerbations was reduced by half in ex-smokers who did not smoke passively.

In our study, the passive smoking exposure rate was found to be 43.05% in COPD patients. This rate was higher in the women patients (69.56%). In a study conducted in Turkey, passive smoking was reported at a high rate in women with COPD.[29] It was remarkable that the passive smoking exposure was quite high in both current smokers and ex-smokers (57.50% and 37.83%, respectively). It was noteworthy that one out of three ex-smoker COPD patients was exposed to passive cigarette smoke indoors. It has been reported that passive smoking increases the risk of developing COPD.[13] In a comprehensive study, it has been reported that approximately 20% of COPD patients live with a smoker, and living with a smoker negatively affects SGRQ, SF12, CAT scores, and symptoms.[7] In our study, the m-MRC score was statistically significantly higher in ex-smoker COPD patients with passive smoking exposure than without exposure. In addition, the number of emergency/hospital admissions in ex-smoker COPD patients with passive smoking exposure was approximately two times higher than without exposure. These data clearly showed that passive smoking exposure should be prevented as well as smoking cessation to control COPD exacerbations. It is known that

exacerbations of COPD negatively affect both the quality of life and the prognosis of the disease. In our study, data showed that both active and passive smoking exposure should be prevented to control the symptoms exacerbations and to improve the quality of life in COPD patients.

Passive smoking exposure was particularly higher in women COPD patients (69.56%), and 18.75% of these patients had never smoked. In previous studies has been reported that women are more sensitive to cigarette smoke and may develop COPD even at lower exposures.[8,30] These findings demonstrated the importance of passive smoking exposure. Therefore, social awareness should be created, and new strategies should be developed to prevent passive smoking exposure, especially in indoor environments in COPD patients.

Although it was observed that passive smoking exposure negatively affected respiratory functions, it was not statistically significant as in the active exposure in our study. FEV_1 levels of ex-smoker COPD patients with passive smoking exposure were lower than those without smoking exposure, but the difference was not statistically significant. However, the quality of life of those with COPD who had active/passive exposure to smoking was declined. Further studies are needed in this area

Active/passive smoking exposure was observed in most COPD patients. Passive smoking exposure was very high, especially in women with COPD patients. According to our data, our main goal in the follow-up of COPD patients should be the prevention of active/passive smoking exposure, which decreases respiratory functions, increases complaints, increases the number of exacerbations, and causes deterioration in the quality of life. Hence social awareness should be created in terms of passive smoking exposure, especially in women COPD patients, and strategies to prevent passive smoking exposure should be developed.

Limitations

Our study is important in terms of the limited number of studies in the literature regarding the effect of passive cigarette exposure on exacerbation and quality of life in COPD. Although the data of our study showed the effect of passive cigarette exposure in COPD exacerbations and quality of life, more comprehensive studies were needed to be statistically significant. With the increase in the number of cases followed in the AKIZ project, the effects of passive cigarette exposure on exacerbation and quality of life in COPD will be more clearly evaluated in larger study groups.

Ethical Considerations: The necessary approval for the study was obtained from the Akdeniz University's Clinical Research Ethics Committee (Decision number: 2019/1109), and the Declaration of Helsinki and ethical principles were applied. The voluntary consent of the patients was obtained.

Conflict of Interest: The authors declare no conflict of interest.

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