Original Article

Effect of passive smoking on the development of chronic obstructive pulmonary disease in southeastern Turkey

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Aim: To determine the effect of passive smoking on the development of chronic obstructive pulmonary disease (COPD) among persons who spend a long time in cafes.

Materials and methods: The study sample included 348 male smokers who were older than 40 years and spend a long time in cafes. The questions were derived from the European Coal and Steel Community (ECSC) questionnaire. We also inquired about the nature of cafe visits (hours/day, visits/week, visits/month).

Results: COPD was found in 18.1% (63/348 subjects) of the smokers aged ≥40 years. In these 63 subjects, based on spirometry results, the rate of mild and moderate airflow limitation was 23.8% (15/63) and 76.2% (48/63), respectively. Of the 63, 60 (95%) had no previous diagnosis of COPD. After we had accounted for known risk factors for the development of COPD, we identified new risk factors: time spent in cafes (hours/day), the number of cafe visits per week (visits/week), and the number of cafe visits per month (visits/month), which had higher odds ratios for smokers without COPD (5.376, 2.721, and 2.337, respectively).

Conclusion: Spending time in cafes regularly may contribute as an additional risk factor for the development of the COPD.

Key words: COPD, smoking, spirometry

Güneydoğu Anadolu'da kronik obstrüktif akciğer hastalığı gelişiminde pasif sigara maruziyetinin etkisi

Amaç: Bu çalışma uzun zamandır kahvehanelere giden kişiler arasında kronik obstrüktif akciğer hastalığı (KOAH) gelişiminde pasif sigara dumanı maruziyetinin etkisini belirlemek amacıyla yapıldı.

Yöntem ve gereç: Çalışmaya 40 yaşından büyük, sigara içen ve kahvehanede zaman geçiren toplam 348 erkek dahil edildi. Sorular Avrupa Kömür ve Çelik Topluluğu anketinden elde edildi. Ayrıca olguların kahvehanelere gidişleri kaydedildi (saat/gün, ziyaret sayısı/hafta, ziyaret sayısı/ay).

Bulgular: KOAH 40 yaşından büyük sigara içenler arasında % 18,1 (63/348 olgu) idi. Bu 63 olguda spirometrik olarak sırasıyla % 23,8 (15/63) ve % 76,2 (48/63) hafif ve orta derecede hava akımı kısıtlılığı saptandı. Bu 63 olgunun 60'ına (% 95) daha önceden KOAH tanısı konulmamıştı. KOAH gelişiminde bilinen diğer risk faktörlerinin yanı sıra; kahvehanede geçirilen zaman (saat/gün), kahvehaneye haftalık ziyaret sayısı (ziyaret sayısı/hafta) ve kahvehaneye aylık ziyaret sayısı (ziyaret sayısı/ay) olmak üzere üç adet yeni risk faktörü saptandı. KOAH'ı olan grupta KOAH'ı olmayan gruba göre bu üç yeni risk faktörünün olasılık (odds) oranları sırasıyla (5.376, 2721 ve 2.337) şeklindeydi.

Sonuç: Düzenli olarak kahvehanede zaman geçirmek, KOAH gelişiminde ilave bir risk faktörü olarak katkıda bulunuyor olabilir.

Anahtar sözcükler: KOAH, sigara, spirometri

Introduction

Chronic obstructive pulmonary disease (COPD) is a leading cause of chronic morbidity and mortality (1,2). According to the Global Burden of Disease Study, COPD was the 6th leading cause of death worldwide in 1990, and it is predicted to become the 3rd most common cause of death, and the 4th most important disability-producing illness by 2020 (3). Furthermore, the prevalence of COPD is greatly underestimated because it is usually not diagnosed until it is clinically apparent and already moderately advanced (2). Cigarette smoking is the most important risk factor for the development of COPD, and early detection of the disease combined with smoking intervention programs has been shown to have beneficial effects on lung function (2,4). Spirometry is commonly accepted as the gold standard for the diagnosis and assessment of COPD (2). The overall prevalence of COPD in adults is estimated to be 4%-10% (5). However, a prevalence of 30%-50% has been reported in high-risk populations, such as long-term smokers, depending on the characteristics of the population under study and the (spirometric) criteria used for diagnosis (6-10).

The predominant risk factor for COPD in the developed world is cigarette smoking (11). Other factors, including occupational or environmental exposures to dusts, gases, vapors, or fumes, exposure to biomass smoke, malnutrition, early life infections, genetic predisposition, increased airways responsiveness, and asthma, may also be important in some individuals (1,11). Underdiagnosis of COPD and the resulting lack of treatment remains a problem worldwide (12,13).

Cafes (also known as tea-houses), where people have tea and/or coffee, smoke, and spend time in the southeastern Anatolia region of Turkey, are considered to be the most important places of passive smoke exposure. Men living in the region typically spend much time in such cafes. Indeed, they are traditionally visited only by males in Turkey. These cafes are generally located in basements and have poor air circulation and ventilation conditions. Thus, persons who visit these places are always at risk of active or passive smoke exposure.

In this study, we examined the risk of developing respiratory symptoms and COPD among those who frequent such cafes. We determined the frequency of respiratory symptoms and COPD in adult current or former smokers who attended such cafes over a long period of time.

Materials and methods

This study was conducted in accordance with the Helsinki Declaration. The informed consents were obtained from all subjects.

Study area

Two sampling methods were used to randomize the selection of the samples. First, a cluster sampling method was used to reduce variation among cafes throughout the city of Diyarbakır. The city was divided into 3 clusters based on the socioeconomic status. After choosing cafes from the 3 clusters, smokers who were older than 40 years and spend a long time in cafes were selected by a simple random sampling method.

Questionnaire

The questions for cough, sputum production, cigarette smoking, dyspnea, and exposure to biomass were derived from the European Coal and Steel Community (ECSC) questionnaire. We also inquired about the nature of the cafe visits: time spent in cafes (hours/day), the number cafe visits per week (days/week), and the number of cafe visits per month (visits/month) (14).

Diagnosis of COPD

All spirometric assessments were made using the same portable spirometer (Spirolab, Medical International Research, Rome, Italy). Baseline spirometric examination was performed in a standard fashion following the American Thoracic Society/European Respiratory Society instructions. Accordingly, an effort was made to obtain 3 technically acceptable spirograms for each subject with less than 5% variability among them. Following this, the subjects inhaled 400 µg salbutamol (Ventolin inhaler, 100 µg salbutamol in each dose, GlaxoSmithKline, İstanbul, Turkey), and the test was repeated 15-20 min later to evaluate early reversibility. An increase in FVC and/or FEV_1 greater than 12% of the baseline or greater than 200 mL constituted a positive early reversibility test. Subjects who had a

greater than 12% increases in FEV1 were excluded from the study, because this would suggest that they had asthma. The diagnosis of COPD in subjects with symptoms compatible with COPD was made with post-bronchodilator FEV_1/FVC less than 0.7.

COPD was diagnosed in accordance with the GOLD guidelines (2): $FEV_1/FVC < 70\%$, in combination with $FEV_1 > 80\%$ of the predicted value (Stage I), $50\% < FEV_1 < 80\%$ predicted (Stage II), $30\% < FEV_1 < 50\%$ predicted (Stage III), or $FEV_1 < 30\%$ predicted (Stage IV).

Statistical analyses

The mean and standard deviation (SD) for continuous variables and the median values for discrete variables were calculated. The normality of the distributions was analyzed by the Kolmogorov-Smirnov test. For the analysis, the Mann-Whitney test was used. The chi-squared (χ^2) test with Yates correction and Student's t-test were used to assess associations among categorical and continuous variables.

Binary logistic regression analysis was used to determine the risk predictors of COPD. Odds ratios were calculated by a logistic regression method. All variables were included in the model, and then a backwards stepwise procedure was applied. The discriminative ability of the risk predictors to distinguish patients with or without COPD found significant in the binary logistic model were determined using receiver-operating characteristic curve (ROC) and area under the curve (AUC) analyses.

We determined the risk ratios (odds ratios) of the factors for smokers with and without COPD. The risk factors were determined using binary logistic regression and the discriminative ability of the factors was found via ROC and AUC analyses.

Two-sided P values were deemed to be statistically significant at P < 0.05. Statistical analyses were carried out using SPSS (version 12.0 for Windows, SPSS Inc., Chicago, IL, USA).

Results

COPD was found in 18.1% (63/348 subjects) of the smokers aged ≥40 years. In these 63 subjects, based on spirometry results, the rate of mild and moderate obstruction was found to be 23.8% (15/63) and 76.2% (48/63), respectively. Of the 63 identified with COPD, 60 (95%) had no previous diagnosis of COPD and were not treated.

Data about the smokers with and without COPD are presented in Table 1. The time spent in cafes (hours/day), cafe visits per month (visits/month), and cafe visits per week (days/week) were significantly higher in smokers with COPD compared to smokers without COPD.

Smokers with or without COPD were compared according to respiratory symptoms. The number of observations and the COPD symptoms are presented in Table 2. Morning cough, morning sputum production, chronic cough, chronic sputum production, and symptoms during the day were found to be significantly higher in smokers with COPD than in smokers without COPD.

Nargileh smoking was not evaluated for the development of COPD because just 3 subjects smoked nargileh.

As seen in Table 3, binary logistic regression analysis showed significant predictors for COPD. In the model, the time spent in cafes (hours/day), the number of cafe visits in a month (days/month), and the number of cafe visits in a week (days/week) were found to be significant predictors for COPD. The odds ratios (with 95% CI values) of those factors found significant in the model are as follows: 5.376 (2.865-10.08), 2.721 (1.720-4.304), and 2.337 (1.779-3.069), respectively. The odds ratios for these 3 predictors were high and significant (P < 0.001). The binary logistic model had the highest proportion of correct classifications of cases and controls (96.1%).

ROC curves and AUCs values of the predictors found to be significant by the logistic regression method were determined. The ROC curves and AUCs of the 3 predictors are shown in the Figure. ROC curves and AUCs values of these 3 predictors provided high accuracy in distinguishing between smokers with and without COPD. As shown in the Figure, the area under the curve for the time spent in cafes (hours/day), the number of monthly cafe visits (days/month), and the number of weekly cafe visits (days/week) were significant (0.974, 0.939, and 0.937, respectively).

Table 1. Descriptive statistics and the test results of smokers with or without COPD .

	Smokers with COPD (n = 63) $\bar{x} \pm SD$	Smokers without COPD (n = 285) $\bar{x} \pm SD$	T	P
Smoking history in pack-years	47.05 ± 25.55	46.01 ± 23.01	0.265	0.967
95 % CI	35.42 – 58.69	30.27 – 59.48		
Age	59.05 ± 9.410	57.76 ± 10.02	0.941	0.864
95% CI	54.76 – 63.33	49.54 – 61.35		
Starting smoking age	19.23 ± 10.29	17.93 ± 7.99	0.513	0.610
95% CI	13.51 – 24.92	15.77 – 20.09		
Living in urban area	36.90 ± 15.65	30.90 ± 14.59	1.682	0.952
95% CI	29.78 – 44.03	27.92 – 33.89		
Time spent in cafes (hours/day)	5.712 ± 2.791	1.121 ± 0.416	13.01	<0.001
95% CI	4.112 – 7.322	0.560 – 1.852		
Cafe visits per week (visits/week)	Median: 6	Median: 3	3.5^m	<0.001
Min-max	5 – 7	0 – 4		
Cafe visits per month (visits/month)	Median: 25	Median: 11	5.6^m	<0.001
Min-max	16-32	5-16		

Mean ± Standard deviation ($\bar{x} \pm SD$),
95% CI: Confidence interval was used for continuous variables,
Median values and minimum - maximum for discrete variables,
^{m}: Mann-Whitney U test was used for discrete variables, and Student's t test for continuous variables.

Table 2. Number of observations and the test results of the respiratory symptoms.

	Smokers with COPD (n = 63)	Smokers without COPD (n = 285)	χ^2	P
Morning cough	15	36	4.299	.038
Morning sputum production	15	27	8.687	.003
Chronic cough	15	27	8.687	.003
Chronic sputum production	12	24	5.188	.023
Symptoms during the day	7	10	4.886	.027
Smoking parents	39	174	.001	.999
Smoke in work-place	43	210	.517	.472
Exposure to biomass	30	140	.108	.742
Cough in childhood	3	15	.001	.999

χ^2: chi-squared test with Yates correction

Table 3. Outcomes of the binary logistic regression analysis.

|	β	SE	Wald	OR(95%CI)	P
Time spent in cafes (hours/day)	1.682	0.321	27.45	5.376 (2.865-10.08)	<0.001
The number of cafe visits per month (visits/month)	1.001	0.234	18.30	2.721 (1.720-4.304)	<0.001
The number of cafe visits per week (visits/ week)	0.849	0.139	37.30	2.337 (1.779-3.069)	<0.001

Classification rate was 96.1%.
β: Regression coefficient
SE: Standard error of regression coefficient
OR (95% CI): odds ratio with 95% confidence interval
Wald: The value of Wald statistics
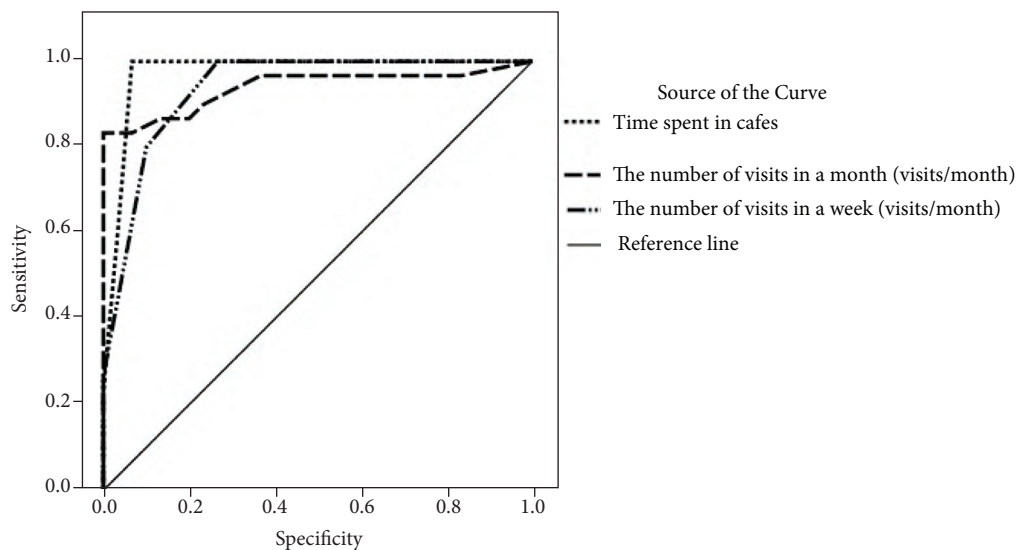
Test result variable(s)	AUC	Standard Error	P	Lower	Upper
				95% CI	
Time spent in cafes	0.974	0.021	<0.001	0.931	0.997
The number of visits in a month (visits/month)	0.939	0.034	<0.001	0.871	0.988
The number of visits in a week (visits/month)	0.937	0.031	<0.001	0.876	0.992

Figure. ROC and AUC values of age, smoking history, and the time spent in cafes for subjects with and without COPD.

Discussion

To the best of our knowledge, this is the first study to show that spending long periods of time in cafes may be a risk factor for developing COPD. Because of socio-economic conditions, men living in southeastern Turkey tend to spend a lot of time in these cafes. The odds ratios for developing COPD among those smokers spending long times in cafes have not yet been studied.

The main focus of the current study was on the differences between smokers who had smoked for the same amount of time with and without COPD. The COPD ratios in smokers who spent more time in cafes (hours/day) and visited cafes more weekly and monthly were found to be significantly higher than in smokers without COPD. These results are informative and different from the known risk factors exerting an influence on the development of COPD. The odds ratios for the risk factors were found using a binary logistic regression model. Furthermore, the AUC values explaining the discriminative ability of the risk factors that distinguish smokers with and without

COPD were found using receiver-operating characteristic (ROC) analysis. Both methods are sensitive for determining risk factors among predictors when the dependent variable is dichotomous (15).

The risk factors found for the development of COPD had high odds ratios for smokers without COPD (5.376, 2.337, and 2.721, respectively). Furthermore, AUC values indicating the discriminative ability of smokers with or without COPD were significant; the AUC values for these 3 variables (hours/day, visits/week, and visits/month) were 0.974, 0.937, and 0.939, respectively.

In this study, all of our subjects were males aged ≥40 years and current smokers. Smoking is the major risk factor for the development of COPD and accounts for 89%-fact, only a small proportion (about 15%) will develop clinically relevant COPD. Why only a fraction of smokers develop clinical manifestations of the disease has been a focus of research in COPD pathogenesis (16-18).

According to some studies, cigarette smoking is clearly still the most important COPD risk factor worldwide. However, there are other important risk factors, such as air pollution, genetic factors, dietary intake low in vegetables, fruits, and flavonoids (e.g., tea consumption), occupational exposure (e.g., farming), exposures to biomass smoke during heating and cooking, and exposure to passive smoking (19-25). In the current study, spending long periods of time in cafes was a risk factor for developing COPD in male smokers. Cafes are considered the main locus of smoke exposure because most of the male visitors smoke. It was observed that male smokers with COPD spent an average of 6 h per day in cafes, while male smokers without COPD spent an average of only 1 h per day. The frequencies of visit to cafes per week and

per month in male smokers with COPD were also found to be higher compared to male smokers without COPD. The frequencies of visiting cafes in male smokers with COPD per week and per month were 6 and 25 times, while these frequencies in male smokers without COPD were only 3 and 11 times, respectively.

COPD was diagnosed in 18.1% of the subjects. An interesting finding was that 95% of the 63 smokers in this sample had not been previously diagnosed with COPD and were unaware of their disease. In the 63 subjects, based on spirometry results, the rate of mild and moderate obstruction was found to be 23.8% (15/63) and 76.2% (48/63), respectively. Thus, at least some of these patients did not experience cough, sputum production, or dyspnea.

Another finding was that morning cough, morning sputum production, chronic cough, chronic sputum production, and symptoms during the day were significantly more common in smokers with COPD than in smokers without COPD. These results are consistent with other reports (1,2,13,24).

This study has several limitations. No female subjects were included, because typically only males frequent the cafes. Moreover, as age and smoking history were assumed to be confounding variables, they were controlled at the beginning of the study.

Conclusions

COPD is an important health problem particularly among adult males of the ages studied, as well as in other groups at risk. It frequently goes un- or underdiagnosed, and treatment still remains unsatisfactory in our region. Spending time in cafes regularly may contribute as an additional risk factor for the development of the COPD.

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