Research Paper

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# Chronic Obstructive Pulmonary Disease and Its Risk Factors: a Case Control Study

Medical Science

**KEYWORDS :** COPD risk, smoking, solid fuel

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| **Entela Nako** | Health Center- Dispensary for Pulmonary Diseases, Tirana-Albania |
| **Laureta Malushi** | Pharmaceutical Company 'KRKA", Tirana-Albania |
| **Enver Roshi** | Faculty of Public Health, Medical University of Tirana, Albania |

## ABSTRACT

*Chronic obstructive pulmonary disease (COPD) is a leading cause of chronic morbidity and mortality. The aim of this study is understand the role of risk factors for occurrence of COPD. A case control study was carried out at Dispensary of Tirana district over the two year period January 2012 – December 2013 were included in the study. Cases were recruited from newly diagnosed outpatient cases of mild, moderate or severe COPD. Controls were obtained from outpatients consulting for various extra-pulmonary problems. All patients answered a standardized questionnaire after obtaining informed consent.*

*Age ≥60yrs, smoking, environmental tobacco smoking (ETC) exposure at home and exposure to solid fuel smoke at home are significant independent risk factors for COPD. Public health implications should include promotional campaigns to quit smoking and measures to ameliorate the indoor levels of air pollution.*

## INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is one of the leading causes of morbidity and mortality worldwide and is expected to increase in coming decades. The development of COPD usually takes several decades, but most of the longitudinal studies of COPD only span 5–10 years (Pauwels & Rabe, 2004; Celli et al, 2004). It is a disabling condition associated with progressive airflow limitation, with symptoms of cough, dyspnea and sputum phenotype. It is an irreversible condition (Rabe et al., 2007). An estimated 80% to 90% of COPD is due to cigarette smoking. A risk of 15% for clinically significant COPD among smokers is commonly cited, but this may be an underestimate (Rennard & Vestbo, 2006). Furthermore, it goes largely undiagnosed and is largely unrecognized by governments' officials and the general population, particularly in developing countries (Bridevaux et al., 2010). The prevalence of COPD of any stage in adults rises from 1% in the general population to 9%-10% in people aged ≥ 40 years, but the fact that many Stage I patients may be asymptomatic or present with signs that are not perceived as abnormal suggests that global and national estimates could be underestimated (Mathers & Loncar, 2006). Morbidity due to COPD increases with age, is greater in men than women and is usually affected by other co-morbid chronic conditions, such as musculoskeletal diseases, diabetes mellitus (DM) and cardiovascular disease (Soriano et al., 2010). Patients with COPD may suffer with a worsening of symptoms, recurrent exacerbations, and reduction in lung function that may not be recovered in a small proportion of patients (Halbert et al., 2006). In addition, exacerbations are associated with an impaired quality of life, reduced survival, and a high healthcare expenditure. The impact of COPD on the health care system may be reduced by improving the diagnosis and treatment of the disease in primary care. The reported prevalence of COPD among adults aged 15 years and over ranged from 1.2% in Malta, to 4.7% in Hungary, and 6.2% in Turkey, while in Albania oscillates from 19.6% up to 25.7% (Rabe et al., 2007; Bala & Tabaku, 2010). Among 16 EU member states, average prevalence was 3.1%, with slightly higher prevalence among females (3.5% vs. 2.9%). In several European countries, however, prevalence was higher among males. It is essential to define the target population clearly and to have information on the COPD patient's profile in a real life setting for effective intervention strategies. Smoking is well established as the predominant risk factor for COPD (Caballero et al. 2008). However, more than 17% of the cases occur among nonsmokers (Salvi et al., 2009; Celli et al. 2005) indicating the involvement of other risk factors. Based on the GOLD spirometry criteria, an estimated 17.0%-38.8% of patients with COPD were nonsmokers worldwide, with 23% in USA (15), 22.9% in UK (Birring et al., 2002), and 23.4% in Spain (Pena et al., 2000). Therefore the prevention of development of COPD becomes the most promising option to reduce the burden of COPD. Therefore, we need to understand the various risk factors that lead to the development of COPD. The objective of study was undertaken to understand the role of risk factors such as the tobacco smoking, solid fuel combustion and other environmental exposures for occurrence of COPD among outpatients with chronic obstructive pulmonary disease during their routine examination in the dispensary of lung diseases.

## MATERIAL & METHOD

The present case control study was carried out at Dispensary of Tirana district over the two year period January 2012 – December 2013 were included in the study. The whole study population was composed of non-hospitalized individuals. The COPD group was composed of consecutive newly diagnosed outpatient cases of mild, moderate or severe COPD which was diagnosed by using the standard criteria for chronic bronchitis, i.e. presence of cough with expectoration for more than three months in a year for the past two or more years excluding other causes of chronic cough with expectoration. COPD cases were included if they were; ≥ 40 years of age, free of any other respiratory disease, diagnosed with COPD by a chest physician and had a post-bronchodilator FEV1/FVC <0.7. They were compared with an age and gender matched control group. Consecutive outpatients consulting for various extra-pulmonary problems were included as controls if they were; ≥ 40 years of age, free of COPD or any other respiratory disease (no asthma, no lung cancer, no lung fibrosis) and not complaining of any chronic respiratory symptom (no chronic cough, no chronic sputum production, no wheezing, no dyspnea at rest or on exertion); no other exclusion criterion was applied. They were all taken from outpatient clinics situated close to the respiratory clinic: patients attending clinics of cardiology, endocrinology, dermatology, nephrology, hematology, urology, gastroenterology, gynecology, ophthalmology, presurgery consultation and Ear, Nose and Throat were approached. After obtaining informed consent from each patient a detailed history of each patient was taken. The variables used for analysis included the age, gender, usual place of residence, smoking habits and the type of cooking fuel combustion at home. A smoker was defined by the presence of regular smoking of any type i.e. cigarettes, for one year or more. Exposures to environmental tobacco smoke was also evaluated. Exposure to cooking fuel combustion was considered positive if the individual gave the history of regularly cooking at home. The types of cooking fuels used at

home included liquefied petroleum gas, kerosene, or the solid fuels i.e. coal, dried wood, dung and other products of animal or plant origin (biomass fuels). Cumulative smoking doses were subsequently calculated, as frequency multiplied by mean quantity: for cigarettes, it was the number of packs per day multiplied by the duration of smoking in years (packs*years) and the mean number of hours of exposure to their smoke. Passive smoking among never and ex-smokers was addressed by questions about the number of smokers at home and at work, and the mean number of hours of exposure to their smoke.

**Statistical analysis**

The statistical analysis was performed using SPSS software. Continuous variables were expressed as mean ±standard deviation (sd) and categorical variables as frequencies. A comparison of case and control characteristics was conducted using the independent t-test for quantitative variables after testing for normal distribution. The associations between categorical variables were tested using chi-square test.

An unconditioned multivariate logistic regression model was used to obtain the association between exposures and COPD, after adjusting for potential confounders. Interactions between tobacco smoke and ETC exposures were tested for using stratified analysis and the logistic model. A test was considered statistically significant when p <0.05.

**RESULTS AND DISCUSSION**

In the present study, 233 cases of COPD cases and 233 controls were included. The distribution of cases as well as controls was almost the same according to gender and across all age groups without a significant difference between them. The majority of patients are males (65.2%): male/female ratio 1.9:1. (Table 1). The mean age of patients is 68 (±7.4) yrs whereas the mean age of controls is 67(±9.2) (p=0.05). Most affected were age group 50-59yrs (33.1%) and 60-69yrs (38.4%). The general and pulmonary function test were altered in cases with a significant difference as compared to controls.

No history of smoking was found in 16.2% of cases of COPD as compared to 35.5% among controls. Among cases 30.3% were ex-smoker and 53.5% current smokers while among controls 33.4% were ex-smoker and 31.1% current smokers. Significantly higher percentages of cases of COPD were having history of smoking as compared to controls (p= <0.001). COPD patients had smoked more pack-years as compared to controls (p<0.001). Exposures to environmental tobacco smoke (ETS) were significantly higher among COPD patients (57.5%) than control subjects (32.2%), (p<0.01). Current exposures to ETS, both at home & work were more prevalent among COPD patients than control subjects, with a statistically significant difference as compared to controls (Table 2). Exposure to solid fuel smoke at home were significantly more prevalent among COPD patients (31.3%) than control subjects (14.6%) (p<0.01). Table 3, shows the multivariate logistic regression for factors predicting COPD in the study. The final retained model suggested that except the current exposure of ETS at work all other variables are independent risk factors of COPD.

The present study demonstrates a strong statistically significant association between smoking, environment tobacco smoking and indoor pollution in outpatients with COPD.

This finding is consistent with the available literature on air pollution and human health effects.

This study showed that proportion of males who smoke (57.5%) was significantly higher in case group than control group (39.1%). This is consistent with other studies who reported that COPD is distinctly more common amongst men (Radin et al., 2008). We found in our study that significantly higher percentages of cases of COPD were having history of smoking as compared to controls. In our study we found that 83.7% of COPD patients were ever smoker (current/past) while among controls it is 64.4%. COPD patients had smoked higher more pack-years as compared to controls (Salameh et al., 2011). Exposures to environment tobacco smoke were found significantly higher among case-patients than control subjects in this study as well as exposure to solid fuel smoke at home. Only current exposure of ETS at work wasn't associated with the disease in a multivariate regression model. Our study reveals that smoking is a major risk factor for COPD is consistent with various other studies (Waked et al., 2011). This is the first study in Albania to identify the risk factors among outpatients with COPD in capital city, Tirana. Another study conducted in Albania has only explored the link between work-place air pollution and COPD in iron-steel and ferrochrome industry workers (Bala & Tabaku, 2010). Although active smoking it is widely acknowledged as the most important independent risk factor for the development of COPD the environmental exposure to tobacco has also been shown to be important risk factor for development of COPD in present study. The association between indoor air pollutants resulting from wood household fuel and respiratory health has already been established in other settings (Orozco-Levi et al., 2006). Studies have showed that adult lung function and susceptibility to COPD were partly determined early in life (Tekin et al., 2010). The results from the present study are in consistent with these observations. Apparently, tobacco smoking's as well as the ETS exposures are important risk factors for COPD prevalence (Hvidsten et al., 2010). Other important risk factor among nonsmoker women was exposure to solid fuel smoke at home was also found in this study.

**CONCLUSION**

The present study revealed that exposure to solid fluid smoke and dust was significantly more prevalent among COPD patients than control subjects. Similar finding were also reported by other studies. Public health implications should include promotional campaigns to quit smoking and measures to ameliorate the indoor levels of air pollution.

**Table 1. Sociodemographic, clinical and tobacco exposure characteristics**

| Variables | COPD patients | Controls | p |
|---|---|---|---|
| Subjects (n) | 233 | 233 | |
| Gender (n,%) | | | 0.9 |
| Male | 152 (65.2) | 151 (64.9) | |
| Female | 81 (34.8) | 82 (35.1) | |
| Age (mean, sd) | 68±7.4 | 67±9.2 | |
| Agegroup, yrs (n,%) | | | 0.9 |
| 40-49 | 20 (8.5) | 21 (9.1) | |

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| 50-59 | 77 (33.1) | 75 (32.4) | |
| 60-69 | 89 (38.4) | 88 (37.7) | |
| ≥70 | 47 (20.3) | 49 (20.8) | |
| Pulmonary function test | | | |
| FEV1 L | 1.7 (1.5–2.0) | 0.9 (0.7–1.2) | <0.01 |
| FEV1 % | 88 (83–100) | 51 (33–75) | <0.01 |
| FEV1/FVC % | 76 (71–80) | 58 (45–73) | <0.01 |
| Smoking (n,%) | | | <0.01 |
| Never | 38 (16.2) | 83 (35.5) | |
| Ex-smoker | 71 (30.3) | 78 (33.4) | |
| Current smoker, | 124 (53.5) | 72 (31.1) | |
| cigarette (cumulative/ day) (n) | | | <001 |
| <1 pack-year | 29 (12.5) | 171(73.3) | |
| 1-18 pack-years | 34 (14.4) | 31 (13.4) | |
| 18.1-45 pack-years | 80 (34.4) | 22 (9.6) | |
| >45 pack-years | 89 (38.4 | 9 (3.7) | |
| | | | |

**Table 2– History of exposure of dust, environment tobacco smoke among COPD cases and Controls**

| Variables | COPD patients | Controls | p |
|---|---|---|---|
| History of ETS | 134 (57.5) | 75 (32.2) | <0.01 |
| Current exposure of ETS at home | 97 (41.6) | 50 (21.5) | <0.01 |
| Current exposure of ETS at work | 33 (14.2) | 18 (7.7) | 0.03 |
| Exposure to solid fuel smoke at home | 73 (31.3) | 34 (14.6) | <0.01 |

**Table 3. Predictors of COPD. Multivariate logistic regression.**

| Variables | COPD patients | Controls | ORa (95%CI) | p |
|---|---|---|---|---|
| Age, yrs | | | | |
| <60 | 107 (34.8) | 137 (35.1) | 1 | |
| ≥60 | 126 (65.2) | 96 (64.9) | 1.68 (1.16-2.42) | <0.01 |
| Ever cigarette smoking (n,%) | | | | |
| No | 38 (16.3) | 83 (35.6) | 1 | |
| Yes | 195 (83.7) | 150 (64.4) | 3.35 (2.12-5.28) | <0.01 |
| Smoking status by gender (n,%) | | | | |
| Female | 99 (42.5) | 142 (60.9) | 1 | |
| Male | 134 (57.5) | 91 (39.1) | 2.22 (1.53-3.22) | <0.01 |
| Current exposure of ETS at home (n,%) | | | | |
| No | 136 (58.4) | 183 (78.5) | 1 | |
| Yes | 97 (41.6) | 50 (21.5) | 2.42 (1.62-3.62) | <0.01 |
| Current exposure of ETS at work (n,%) | | | | |
| No | 200 (85.8) | 215 (92.3) | 1 | |
| Yes | 33 (14.2) | 18 (7.7) | 1.50 (0.85-2.65) | 0.1 |
| Exposure to solid fuel smoke at home (n,%) | | | | |
| No | 160 (68.7) | 199 (85.4) | 1 | |
| Yes | 73 (31.3) | 34 (14.6) | 2.45 (1.55-3.86 | <0.01 |
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