

Clinical Features and Environmental Exposures of Adult Never-Smoker Chronic Obstructive Pulmonary Disease Patients in Sri Lakshmi Narayana Institute of Medical Science, Pondicherry

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ABSTRACT

BACKGROUND

Active smoking is responsible for nearly 70 % of the cases of chronic obstructive pulmonary disease (COPD) in developed countries and is much lesser in the developing nations. Though the remaining are attributed to environmental tobacco exposures, occupational factors and genetic factors, there are not enough studies demonstrating the causation. This study is to identify the clinical features of never-smoker patients with COPD and the prevalence of environmental exposures in COPD patients.

METHODS

An observational cross-sectional study was conducted from Nov. 2018 to Jan. 2019. All patients above 18 years with respiratory symptoms and satisfying the following diagnostic criteria for COPD were included. All patients included in the study must be never-smokers. Control group of 20 healthy individuals were included. A detailed demographic profile and medical history was obtained from all participants. Pulmonary function assessment was done for all. Chi-square test was used for analysing data.

RESULTS

Cough was the most common symptom (88.2 %) in these patients. Dyspnoea was present in 21 patients (41.17 %). In the study participants, 36 were exposed to environmental tobacco smoke (ETS) or passive smoking. Out of them 29 patients (80.5 %) were exposed to passive smoking at home, 15 patients (41.7 %) were exposed to passive smoking at work and 8 patients (22.2 %) at both places. The number of patients who practiced firewood cooking was 31 (40.8 %). The relationship seen between the test and control group was found to be statistically significant.

CONCLUSIONS

COPD in never smokers is more common in females compared to males. Cough is the most common symptom in this subset of patients with COPD. There is a high rate of exposure to environmental tobacco smoke and firewood smoke in never-smokers who develop COPD.

KEYWORDS

COPD, Adult Never Smokers, Environmental Exposures, Passive Smoking

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BACKGROUND

Chronic obstructive pulmonary disease is an inflammatory disease condition in which there is progressive irreversible decrease in airflow. It is a leading cause of morbidity and mortality affecting adults worldwide. Tobacco smoking is established as a major risk factor, but other risk factors are important especially in developing countries such as India. Studies on COPD have been largely limited to smoking as a causative factor rather than non-smoking population. An estimated 25 - 40 % of the COPD patients have never smoked, the burden of non-smoking COPD is much higher than previously expected.

COPD is characterised by slowly progressive and irreversible decrease in forced expiratory volume (FEV) 1 and FEV 1 reductions are caused by narrowing of airway lumen diameters. Estimated COPD patients have low FEV 1 and low FEV 1 / forced vital capacity (FVC).^{1,2} Active smoking is responsible for nearly 70 % of the cases of COPD in developed countries and its contribution is much lesser in the developing nations.³ Though the remaining are attributed to environmental tobacco exposures, occupational factors and genetic factors, there are not enough studies demonstrating the causation for the rest of the proportion of the COPD patients.^{4,5} Though environmental tobacco smoke (ETS) exposure is considered as an accepted risk factor for lung malignancy, its association with COPD is less clear.⁶ In a study done by Jordan et al. it was shown that those exposed to > 20 hours of ETS had an excess risk of 98 % compared to others.⁷

Whittemore suggested that the prevalence of COPD in non-smokers increases with age and lower socio-economic status.⁸ Xu et al. found that there is a decrease in FEV1 and FEV 1 / FVC patients exposed to ETS at home or work compared to individuals who are not exposed to the same.⁹ Some studies have suggested the exposure to dust, fumes and fire-wood cooking as risk factors.¹⁰ The COPD developed in individuals exposed to fire-wood cooking has been found to be phenotypically distinct from tobacco related COPD.¹¹

We conducted this study to identify the clinical features of never-smoker patients with COPD and the prevalence of environmental exposures in COPD patients.

METHODS

An observational cross-sectional study was conducted from Nov 2018 to Jan 2019 in medical out-patient department (OPD) of Sri Lakshmi Narayana Medical college, Pondicherry to determine the clinical profile and environmental exposure of never-smoker COPD patients. Ethical approval to perform the study was obtained before starting the study, NO. IEC / C – P / 28 / 2018. The continuous sampling method was used. Patients included were explained about the nature of the study in detail and informed consent was obtained. Control group of 20 healthy individuals were included for comparing and analysing the data. The patients underwent a detailed history, examination, and investigations.

Inclusion Criteria

All patients aged above 18 years attending the medical OPD with respiratory symptoms and satisfying the following diagnostic criteria for COPD.

- The presence of a post-bronchodilator FEV 1 / FVC < 0.70 by spirometry

Exclusion Criteria

History of myocardial infarction (MI) and other co morbid conditions

Chronic Asthma

Patients of bronchiectasis, interstitial lung diseases (ILD) and other chronic respiratory diseases

All patients included in the study must not have any history of smoking habits

Study Procedure

A detailed demographic profile regarding age, occupation, socio-economic factors was obtained from all the patients. Medical history was obtained from all the participants and a complete respiratory system profile for all the patients was taken regarding symptoms like wheeze, dyspnoea, cough and expectoration. Control group of 30 healthy individuals were involved in the study and were evaluated during the course of the study.

Pulmonary function assessment was done for all the patients using a spirometer and they were classified into various stages of COPD using the GOLD criteria.

GOLD Class	Severity	FEV1
GOLD 1	Mild	FEV 1 ≥ 80 % predicted
GOLD 2	Moderate	50 % ≤ FEV1 < 80 % predicted
GOLD 3	Severe	30 % ≤ FEV1 < 50 % predicted
GOLD 4	Very severe	FEV1 < 30 % predicted

Table 1. Grading of COPD Based on GOLD Criteria

Environmental exposure of the study participants was obtained regarding environmental tobacco smoke (passive smoking) and exposure to firewood cooking.

Statistical Analysis

The description of qualitative data was done in absolute frequencies and percentages. Data was analysed using SPSS 17 and Microsoft Excel 2007 software. The description of quantitative data as mean standard deviation, median, minimum and maximum were done. Chi-square test was used for analysing the categorical data and interpreting the associations.

RESULTS

The staging of the COPD patients was done according to the GOLD criteria (Table-1). 26 patients (51 %) belonged to stage 1, 20 patients (39.2 %) to stage 2, 3 patients (5.88 %) to stage 3 and 2 patients (3.9 %) to stage 4.

Table 2 data shows that out of 51 study participants, the most common age group was between 45 and 65 years and

the mean age was 48 ± 1.2 years. Out of the study participants 45 % of them were males. The most common occupation in the study population was agricultural labourer 74.5 % followed by industrial work 9.8 % and the rest of them were unemployed. The respiratory symptoms of the study participants were obtained. Cough was the most common symptom (88.2 %) in these patients. Most of them had excessive cough in the early morning (78.2 %) or in the night (65 %). People having cough during the day time were much less (15 %) as from Table-2.

The Table - 2 data shows that 32.9 % of them had cough which was either mucoid, mucopurulent or frank purulent sputum. Wheeze or noisy breathing was present in 72.5 % of the patients. Dyspnoea was present in 21 patients (41.17 %) and it was classified according to the MRC grading. Out of these patients, 19.1 % had Grade 1 dyspnoea, 28.6 % had Grade 2, 33.3 % had Grade 3, 14.3 % had Grade 4 and 4.7 % had Grade 5. The treatment history of the study participants was obtained which showed that 96.1 % of them were on bronchodilator therapy, 39.2 % on inhalational steroids and 9.8 % on oral steroids.

	Characteristic	Number (N=51)
Age	< 45 years	8 (15.7 %)
	46 - 65 years	36 (70.6 %)
	> 66 years	7 (13.7 %)
Sex	Male	23 (45.1 %)
	Female	28 (54.9 %)
Occupation	Agricultural labourer	38 (74.5 %)
	Industrial labourer	5 (9.8 %)
	Unemployed	8 (15.7 %)
GOLD staging	1	26 (51 %)
	2	20 (39.2 %)
	3	3 (5.8 %)
	4	2 (3.9 %)
Respiratory symptoms	Wheeze	37 (72.5 %)
	Cough	45 (88.2 %)
	Expectoration	15 (32.9 %)
	Dyspnoea (N = 21)	21 (41.17 %)
	MRC Grade 1	4 (19 %)
	MRC Grade 2	6 (28.6 %)
Medications	MRC Grade 3	7 (33.3 %)
	MRC Grade 4	3 (14.3 %)
	MRC Grade 5	1 (4.7 %)
	Bronchodilator therapy	49 (96.1 %)
	Inhalational steroids	20 (39.2 %)
	Oral steroids	5 (9.8 %)

Table 2. Baseline Characteristics of the Study Population

Table-3 data shows that in the study participants, 36 of them were exposed to environmental tobacco smoke (ETS) or passive smoking. Out of them, 29 patients (80.5 %) were exposed to passive smoking at home, 15 patients (41.7 %) were exposed to passive smoking at work and 8 patients (22.2 %) at both places. The average hour of exposure to environmental tobacco smoke per week over the past 1 year was 20 - 60 hours per week for more than 80 percent of the individuals who had exposure to ETS. The number of patients who practiced firewood cooking was 31 (40.8 %). Of the people who practiced fire wood cooking, 11 patients were exposed to firewood smoke for 1 - 10 years, 12 patients for 10 - 20 years and 8 patients for more than 20 years.

Table 4 shows the risk factor of environmental exposure to tobacco smoke among groups in the study. Out of the 51 participants in the test group, 36 (70.5 %) were exposed and 15 (43 %) were not exposed whereas in the control group, 13 (29 %) were exposed and 17 (57 %) were not

exposed. Data from both the groups were analysed for statistical significance.

Similarly, Table 5 shows the risk factor of the firewood smoke exposure among the groups in the study. Out of 51 participants in the test group, 31 (70.5 %) were exposed and 20 (43 %) were not exposed whereas in the control group, 11 (29 %) were exposed and 19 (57 %) were not exposed. Data from both the groups was analysed for statistical significance.

Characteristic	Number (N=51)	
Environmental tobacco smoke exposure (ETS)	Yes	36 (70.6 %)
	No	15 (29.4 %)
ETS at home (N = 36)	ETS at home (N = 36)	29 (80.5 %)
	ETS at work (N = 36)	15 (41.7 %)
	ETS both at work and home (N = 36)	8 (22.2 %)
Average hours of ETS exposure per week (N = 36)	< 20	5 (13.8 %)
	20 - 60	29 (80.5 %)
	> 60	2 (5.6 %)
Number of years of firewood cooking	1 - 10	11 (21.6 %)
	10 - 20	12 (23.5 %)
	> 20	8 (15.7 %)
	Nil	20 (39.2 %)

Table 3. Environmental Exposures of the Study Population

Exposure to Environmental Tobacco Smoke	Test Group (51)	Control Group (30)	x ² (P)
Yes	36 (70.5 %)	13 (43 %)	5.87 (0.01) *
No	15 (29.5 %)	17 (57 %)	

Table 4. Risk Factor of Environmental Exposures to Tobacco Smoke among the Groups in the Study

*indicates statistically significant association

Exposure to Firewood Smoke	Test Group (51)	Control Group (30)	x ² (p)
Yes	31 (60.7 %)	11 (36.6 %)	4.40 (0.03) *
No	20 (39 %)	19 (63 %)	

Table 5. Risk Factor of the Firewood Smoke Exposure among the Groups in the Study

*indicates statistically significant association

DISCUSSION

Smoking is the most common risk factor for the development of COPD as shown in many studies. We in this study have analysed the symptoms of COPD in never smoker patients. We have found that cough is the most common symptom associated with COPD in this patient population followed by wheeze. We have also identified the association of environmental factors like environmental tobacco exposure (ETS or passive smoking) and the practice of firewood cooking with COPD in patients who have never smoked in life. In a previous study done by Hagstad et al. it was shown that 60 % of never smoker COPD patients had ETS exposure at home or at work. In our study it was 70.6 % of the total number of study patients. We have also shown that passive smoking at home by one of the family members was much more than that of the exposure at work.

In this study it was shown that both past and current firewood cooking is very prevalent (61.8 %) in never smoker COPD patients. This was more common in female patients. Though the prevalence is higher in this study population, it is possible to conclude the causation only from higher study models like a case control or cohort study. In the study by Torres et al. they have demonstrated that more than 40

years of firewood cooking has been associated with the highest prevalence of non- tobacco associated COPD.

In our study, the stage of COPD was compared with the ETS exposure and exposure to firewood cooking. It was found that the exposure to smoke from firewood cooking was much more related to the development of severe stage of COPD.

CONCLUSIONS

COPD in never smokers is more common in females compared to males. Cough is the most common symptom in this subset of patients with COPD. There was a high rate of exposure to environmental tobacco smoke and firewood smoke in never-smokers who developed COPD.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.

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