A clinical study of chronic obstructive pulmonary disease in non-smokers attending a tertiary care hospital

P V Kalyan Kumar[1], G. Ramakrishna[2,*]

[1,2]Associate Professor, [1]Dept. of Respiratory Medicine, [2]Dept. of General Medicine, Katuri Medical College and Hospital, Guntur, Andhra Pradesh, India

***Corresponding Author: G. Ramakrishna**
Email: drpvkalyan@hotmail.com

Abstract

Background: Chronic Obstructive Pulmonary Disease (COPD) ranks third among the prime causes of death globally.

1. To study the clinical profile of COPD in non-smokers.
2. To identify the other risk factors (other than smoking) of COPD.

Methodology: Data was collected meeting the objectives of the study with a pre-tested proforma. Detailed history was taken, clinical examination was done and necessary investigations were carried out. Continuous data was expressed as Mean + SD and categorical data was expressed as number and percentage (%).

Results: In the present study it was observed that most of the non-smoker COPD patients belonged to older age group. In the present study the mean age of the patients was 55.06 + 8.87 years. study subjects < 40 years were 6%, 40-59 years were 64%, 60-79 years were 30% and >80 years were 0% females account for 68%, with a male to female ratio of 1: 2.125.

Conclusions: In this study of COPD in non-smokers, females were predominant. Cough and sputum production were the most common clinical features. Environmental tobacco smoke exposure and biomass fuel usage were the most common risk factors. Most of the patients belonged to rural background. Most of the patients presented with less severe form of the disease.

Keywords: COPD; Non-smoker; Cough; Biomass; Smoking.

Introduction

Chronic Obstructive Pulmonary Disease (COPD) ranks third among the prime causes of death globally [1]. It occupies fifth position in Southern Asia [2]. As per the Global Burden of Disease Study 2013, more than 300 million people in the world are suffering from COPD [3].

The nature of device used for cooking also has a significant impact on indoor air pollution. In India, four types of cooking devices are commonly used. These are (1) kerosene stove (wick type or pressure type); (2) coal-lighted "angithi;" (3) gas stove operated by liquefied petroleum gas (LPG); and (4) "chulla" in which biomass fuels (dried dung, crop residues, and agricultural wastes) are used [4].

It is well recognized that all kinds of cooking fuels generate respiratory irritants like unburnt hydrocarbons (soot), sulphur dioxide and the oxides of nitrogen. Soot particles that are produced from chulla used for fire wood cooking perhaps are more perilous in causing chronic bronchitis changes and airway obstruction as well. According to various investigators from our country chronic bronchitis among non- smoking women was found to vary between 0.44 - 4.96 percent [5].

The effect of domestic cooking fuels on causing various respiratory symptoms had been studied in about 3,701 women. Of these, 3,608 were non- smoking women who used either of the four different cooking fuels: kerosene, LPG, biomass and mixed fuels.

The respiratory symptoms were noted in 13 percent. Mixed fuel users suffered from more respiratory symptoms than others (16.7%), next comes biomass users (12.6%), stove users (11.4%).

Occupational Exposure: There is increasing evidence from large population centered studies indicating that a unstinting proportion of the COPD cases in a society may be ascribed to exposure to dusts, fumes, noxious gases/ vapours.

The industries such as fabric manufacturing, leather manufacturing, plastics, rubber and construction are associated with augmented risk. The overall risk among never smokers it was 31 percent.

Environmental tobacco exposure or passive smoking is drawing more attention owing to its considerable effects on public health. Environmental tobacco smoke is a blend of side-stream smoke and exhaled main-stream smoke. The side stream smoke has higher concentrations of benzene, ammonia, nicotine, carbon- monoxide, and various carcinogens (2-naphthylamine, 4-aminobiphenyl, n-nitrosamine, benza-anthracene, and benzopyrene) owing to a lower combustion temperature, than that of mainstream smoke [8].

Depending on biochemical markers, such as urinary and salivary levels of cotinine and nicotine, the degree of exposure has been estimated to be equivalent to 0.1–2 cigarettes per a day. Exposure to ETS is virtually unavoidable because it is ubiquitous in workplaces, homes and crowded areas.

Environmental smoke typically troubles females to a much greater degree than males. It conveys ancillary evidence of the grave health hazards linked to environmental smoke. At home females were more commonly exposed to ETS (31% versus 19%), whereas males were more exposed outside (53% versus 7%). The females (37.7%) suffered from more symptoms due to ETS than males (21.6%). These

results urge for a need to ban smoking in the public areas and workplace. The present study was done:-

1. To study the clinical profile of COPD in non-smokers.
2. To identify the other risk factors (other than smoking) of COPD.

Materials and Methods

All the patients who were non-smokers and presented with history of cough, sputum, breathlessness or wheezing of more than 3 months duration to the medical outpatient department or admitted in medical wards of Katuri Medical College & Hospital were subjected to pre and post-bronchodilator pulmonary function testing. The patients whose post-bronchodilator FEV1/FVC less than 0.7 were included in this study. This study period was from November 2016 to May 2018. An ethical committee approval and written informed consent of study subjects was obtained.

Sample Size: 50 patients.

Type of Study: Cross-sectional study.

Inclusion Criteria: Patients with post-bronchodilator FEV1/FVC < 0.7 who were non- smokers.

Exclusion Criteria:

Smokers
Bronchial asthma
Pulmonary tuberculosis (past or present)
Interstitial lung disease
Acute left ventricular failure and pulmonary edema.
Bronchiectasis and chest wall deformities.

Methods and Collection of Data: Data was collected meeting the objectives of the study with a pre-tested proforma. Detailed history was taken, clinical examination was done and necessary investigations were carried out.

A computerized spirometer was used to perform lung function tests. Three satisfactory efforts from the test were recorded and the best effort among them was considered. Bronchodilation was done using 400 µg of inhaled salbutamol using a metered dose inhaler and test was repeated after 15 minutes.

Other Investigations: The following other routine investigations were done.

Hemogram.
Serum creatinine, Blood urea.
Random Blood Sugar.
Sputum for gram stain and Acid Fast stain.
Chest X-ray Postero-Anterior view.
Urine analysis.
Electrocardiogram.

Statistical Methods: Descriptive statistics were used to analyze the data. Continuous data was expressed as Mean $\pm$ SD and categorical data was expressed as number and percentage (%).

Results

Fifty cases were studied and the following observations were made.

Table 1: Age and sex distribution

Age Group (years)	Males	Females	Total	Percentage
31-40	2	1	3	6
41-50	3	7	10	20
51-60	7	15	22	44
61-70	3	9	12	24
71-80	1	2	3	6
Total	16	34	50	100

Mean age of the studied patients was 55.06 $\pm$ 8.87years, minimum age being 37 years and maximum age being 75 years. Majority of patients belonged to age group of 51-60 years.

Out of the 50 cases studied, 34 patients were female and 16 patients were male. Majority were females constituting 68%.

Table 2: Symptoms

Symptoms	Number of patients	Percentage
Cough	50	100
Sputum	50	100
Breathlessness	36	72
Wheezing	12	24
Fatigue	10	20
Swelling of lower limbs	8	16
Weight loss	8	16
Fever	6	12
Chest pain	2	4

Cough and sputum were present in all of the patients while breathlessness was present in 72%, wheezing in 24%, fatigue in 20%, weight loss in 16%, swelling of lower limbs in 16%, fever in 12% and chest pain in 4% of the patients.

Risk Factors

All patients were never smokers.

Table 3A: Biomass fuel exposure

Biomass full exposure	Number of patients	Percentage
No exposure	7	14
Exposure	43	86

Out of 50 patients, 43 patients (86%) gave history of biomass fuel usage and exposure. All 7 patients (14%) who did not have biomass fuel exposure were males.

12 patients (24%) gave history of exposure <6 hours/day, 31 patients (62%) gave history of exposure ≥ 6 hours/day.

Seven patients (14%) gave duration of exposure for biomass fuel for <10 years whereas 36 patients (72%) gave history of duration of exposure for biomass fuel for ≥10 years. Most of the patients with biomass exposure (46.51%) belonged to

GOLD stage 2. About 25.58% belonged to stage 1. Around 23.25% belonged to stage 3 and only 4.65% belonged to stage 4.

Table 3B: Nature of fuel used

Fuel used	Number of patients	Percentage
No exposure	7	14
Firewood	33	66
Firewood + Cow dung	10	20
Total	50	100

Thirty-three patients (66%) gave history of firewood usage and ten patients (20%) gave history of firewood and cow dung usage.

50 patients (100%). Most of the patients, i.e. 47 patients (94%) were exposed for >3 hours, only 3 patients (6%) were exposed for <3 hours in a day. Twenty-one patients (42%) patients were exposed for ≤10 years and 29 patients (58%) for >10 years.

Table 4: Environmental tobacco smoke exposure

ETS exposure	Number of patients	Percentage
ETS exposure present	50	100
No exposure	0	0

History of exposure to environmental tobacco smoke was present in all

Table 5: Occupational exposure

Occupational exposure	Number of patients	Percentage
No exposure	32	64
Dust	10	20
Husk	3	6
Dust + Husk	1	2
Coal dust	2	4
Textile mill	1	2
Total	50	100

Out of 50 patients, only 18 patients (36%) gave history of occupational exposure, 10 patients (20%) gave history of exposure to dust, 1 patient (2%) gave history of exposure to dust and husk, 3 patients (6%) gave history of exposure to husk, 2 patients (4%) gave history of exposure to coal dust and 1 patient (2%) gave history of exposure to textile mill dust.

Duration of Exposure: Three patients (6%) gave history of exposure for ≤10 years and 15 patients (30%) gave history of duration of exposure for >10 years.

Table 6: Place of living

Place of living	Number of patients	Percentage
Urban	9	18
Rural	41	82
Total	50	100

Forty-one patients (82%) were living in rural area whereas 9 patients (18%) were living in urban area.

Table 7: Exposure to air pollution

Pollution	Number of patients	Percentage
Absent	40	80
Present	10	20

20 percent of the patients gave history of exposure to air pollution.

Table 8: Clinical examination findings

Clinical features	Number of patients	Percentage
Raised JVP	7	14
Pedal edema	8	16
Barrel chest	19	38
Decreased movements	30	60
Rhonchi	22	44
Crepitations	46	92

Of the 50 patients, crepitations were noted in 92% of patients. The next most common signs were decreased chest movements (60%) and Rhonchi (44%). Raised JVP was present in 14% and pedal edema in 16% respectively.

Table 9: Chest X-ray findings

Chest X-ray findings	Numbers of patients	Percentage
Chronic bronchitis	12	24
Emphysema	16	32
Chronic bronchitis+Emphysema	6	12
Normal	16	32
Total	50	100

Patients

Chest X-ray showed chronic bronchitis in 12 patients (24%), chronic bronchitis with emphysema in 6 patients (12%), emphysema in 16 patients (32%) and was normal in 16 patients (32%).

Discussion

This study demonstrates clinical profile and various risk factors associated with COPD among non-smokers.

In the present study it was observed that most of the non-smoker COPD. Patients belonged to older age group the mean age of the patients was 55.06 + 8.87 years. Study subjects < 40 years were 6%, 40-59 years were 64%, 60-79 years were 30% and >80 years were 0%.

The age distribution of the present study is comparable to Shammem et al., [6] study in which the distribution was 7.3%, 56.3%, 33.3% and 3.1% for age groups <40, 10-59, 60-79 and ≥80 respectively.

Most of the study subjects belonged to the age group 40-59 in the present study which was comparable to Shameem et al., [6] study.

In the present study, females account for 68%, with a male to female ratio of 1:2.125. In Shameem et al., [6], 63.5% were females and 36.5% were males.

In the present study, the predominant symptoms were cough and expectoration. All the patients had given the history of cough and expectoration. The next common symptoms were breathlessness (72%) and wheeze (24%).

The most common sign noted in the present study was crepitations, seen in 92% of the study subjects. The next common sign was decreased chest movements seen in 60%. Rhonchi were noted in 44% and barrel chest was noted in 38%. Pedal edema and raised JVP were seen only in 16% and 14% respectively.

Environmental tobacco smoke exposure at home and/or at work was 100% in the present study. In similar studies like Berglund et al., [9] and Mahesh et al., [8] the exposure was 62.58% and 60.86% respectively.

Higher cumulative lifetime exposure at work and home were associated with higher risk of developing COPD. The population attributable risk for work exposure was 7% and home ETS exposure was 11%. [10]

Occupational exposure was 36%. In Shameem et al., [6] it was 24%.

A history of biomass fuel exposure was present in 86% of the patients. Exposure to biomass fuel appears to be associated with increased risk of COPD.

The distribution of patients according to GOLD severity staging and biomass exposure shows that 25.58% with biomass exposure had mild disease, 46.51% had moderate disease, 23.25% had severe disease, 4.65% had very severe disease.

It shows that most of study subjects in the present study with biomass exposure belonged to moderate and severe form of disease. This was comparable to the above mentioned study. It was observed that risk of COPD increased with greater the duration of biomass smoke.

The history of exposure to outdoor air pollution was 20 percent in the present study and it is comparable to Tarik. Mahmood et al., [11] study. Fossil fuel combustion mainly from motor vehicles, is associated with decrements of respiratory function. [13] In the present study, 82% subjects were from rural background and it was comparable to Goel et al., [12] study in which 72.73% subjects belonged to rural background Outdoor air pollution, transportation and trucking, farming and livestock exposure are also the factors associated with COPD, exposure of which needs to be reduced, to prevent the development of COPD and to reduce morbidity and mortality associated with it and to improve the quality of life in these individuals, large sample sized, population based studies are further needed to document exact prevalence of risk factors especially in the rural region.

In the present study the distribution of patients according to GOLD severity staging were mild- 30%, moderate- 46%, severe- 20%, very severe- 4%. In this study more patients presented with mild to moderate disease.

Limitations

1. Sample size was small, i.e. only 50.
2. It was a hospital based study. Only symptomatic patients who presented to hospital were studied.
3. Exact quantification of biomass fuel exposure, environmental tobacco smoke exposure, occupational exposure and air pollution was not done.

Conclusions

1. In this study of COPD in non-smokers, females were predominant.
2. Cough and sputum production were the most common clinical features.
3. Environmental tobacco smoke exposure and biomass fuel usage were the most common risk factors.
4. Most of the patients belonged to rural background.
5. Most of the patients presented with less severe form of the disease.

Conflicts of Interests: None declared.

Acknowledgments: Nil.

References

1. Lozano R, Naghavi M, Foreman K. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet* 2012;380:2095–2128.
2. Burney P, Jarvis D, Perez‐Padilla R. The global burden of chronic respiratory disease in adults. *Int J Tuberc Lung Dis* 2015;19:10‐20.
3. Tea V. Global, regional, and national incidence, prevalence, and years lived with disability for 301 acute and chronic diseases and injuries in 188 countries, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet* 2015;386:743–800.
4. Behera D, Jindal SK. Respiratory Symptoms in Indian Women using Domestic Cooking Fuels. *Chest* 1991;100:385-388.
5. Mannino DM. Looking beyond the cigarette in COPD. *Chest* 2008;133:333-334.
6. Shameem M, Alam M, Ahmad, Arshad E. COPD in Non-smokers-Prevalence and Risk Factors. *Br J Med Med Res* 2015;8:165-176.
7. Mahesh PA, Jayaraj BS, Prahalad T. Validation of a structured questionnaire for COPD and prevalence of COPD in rural area of Mysore; a pilot study. *Lung India* 2009;26(3):2.
8. McKay AJ, Mahesh PA, Fordham JZ, Majeed A. Prevalence of COPD in India: A systematic review. *Primary Care Respir J* 2012;21:313‐321.
9. Reeves J, Rubin LJ. The pulmonary Circulation. *Am J Respir Crit Care Med* 1998;157:S101-108.
10. Eisner MD, Balmes B, Katz PP. Lifetime environmental tobacco smoke exposure and the risk of chronic obstructive pulmonary disease; Environmental Health: A Global Access Science Source 2005;4:7.
11. Mahmood T, Singh RK, Kant S, Shukla AD, Chandra A, Srivastava RK. Prevalence and etiological profile of chronic obstructive pulmonary disease in nonsmokers. *Lung India* 2017;34(2):122-126.
12. Trupin L, Earnest G, San Pedro M. The occupational burden of chronic obstructive pulmonary disease. *Eur Respir J* 2003;22:462–469.
13. Gong Huan Yang and Nan-Shan Zhong. Effect of health from smoking and use of solid fuel in China. *Lancet* 2008;372:1445-1446.

How to cite this article: Kumar PVK, Ramakrishna G. A clinical study of chronic obstructive pulmonary disease in non-smokers attending a tertiary care hospital. *Indian J Immunol Respir Med* 2019;4(1):60-64.