

Original Research Article

Etiology and clinical profile of COPD in non-smoker in urban area

Amar R. Pazare¹, Pankti K. Mehta^{2*}

¹Department of Medicine, K. J. Somaiya Medical College, Mumbai, Maharashtra, India

²Department of Medicine, Seth G. S. Medical College, Mumbai, Maharashtra, India

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*Correspondence:

Dr. Pankti K. Mehta,

E-mail: panktimehta_92@hotmail.com

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ABSTRACT

Background: Smoking is established as a causative risk factor for COPD as early as 1950. However, in the past decade it is shown that, other risk factors like indoor and outdoor air pollutants, workplace exposure to dust and fumes, poor nourishment and poor socioeconomic status are also associated with COPD. COPD is a disease associated poor quality of life due to recurrent exacerbations. Till to date focus has been on smoking as a risk factor for COPD, but other factors also need to be taken into consideration.

Methods: Study was conducted in 60 eligible patients from urban area for a period of 18 months. Individual patient was asked detailed personal demographic data, respiratory symptoms, exposure to passive smoking, family history of COPD. Detailed physical examination including Anthropometric measurements and other relevant general and systemic examination was carried out. Biochemical investigations, ECG, Chest X-ray, CT chest, spirometry and 2D echocardiography were carried out in all patients.

Results: The mean age of the patient was 65.7 ± 7.95 with male preponderance. Common symptoms were dyspnea and cough and common signs were rhonchi and hyper resonance note on percussion. Common risk factors were indoor air pollution and low socioeconomic class. Most of the patients has hypoxia and hypercapnia. X-ray chest and CT chest showed hyperinflation, air trapping. Majority of patients had moderate FEV/FVC ratio on spirometry.

Conclusions: Non-smoker COPD patients usually present in old age. Common presentation is dyspnea followed by cough and rhonchi on examination. Most common risk factor for non- smoker COPD is indoor air pollution, low socioeconomic class and cotton mill workers. Amongst indoor pollution, LPG, kerosene and wood are the risk factors for non-smokers COPD in urban population.

Keywords: Air pollution, Biomass, Dyspnea

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a lung disease characterized by chronic obstruction of lung airflow that interferes with normal breathing and is not fully reversible (World Health Organization).

Smoking was established as a causative risk for COPD as early as the 1950s. (Framingham cohort off spring study). However, in the past decade, there are growing number

of published data which suggest that risk factors other than smoking are strongly associated with COPD.

These risk factors include exposure to indoor and outdoor air pollutants, workplace exposure to dust and fumes, history of repeated lower respiratory-tract infections during childhood, history of pulmonary tuberculosis, chronic asthma, intrauterine growth restriction, poor nourishment, poor socioeconomic status, genetic conditions like Alpha 1 Antitrypsin deficiency.¹⁻³

Biomass is also an important risk factor for COPD. The smoke emitted from burning of biomass contains large number of pollutants: particulate matter of less than 10 µm in aerodynamic diameter, carbon monoxide, nitrogen dioxide, sulphur dioxide, formaldehyde, and polycyclic organic matter, including carcinogens (e.g., benzo(a)pyrene).^{4,5}

The chronic airflow limitation is due to a mixture of small airway disease (obstructive bronchiolitis) or parenchymal destruction (emphysema). The relative contributions of which vary from person to person.

Symptoms of COPD includes dyspnea, chronic cough and sputum production. Spirometry is used to make a clinical diagnosis of COPD. Post bronchodilator FEV1/FVC of <0.7 confirms presence of airway limitation and thus of COPD.

COPD is the 4th leading cause of death worldwide. According to a report published by the Maharashtra State Health Resource Centre, COPD is the leading cause of death in Maharashtra, causing more deaths than those due to ischemic heart disease, stroke and diabetes all put together.^{6,7}

COPD is a disease associated with suffering and poor quality of life due to recurrent exacerbations and associated chronic comorbid conditions. COPD is an expensive disease to treat. In a resource-poor country like India, it is a challenge to curb the growing burden of COPD. Thus, COPD becomes an important public health problem that is both preventable and treatable. Preventing the development of COPD therefore becomes the most economically viable option to reduce the burden of COPD. There is a paucity of data regarding the prevalence and socioeconomic burden of COPD available in India, especially in urban areas. Till to date focus has been on smoking as a risk factor for COPD, but other factors also need to be taken into consideration.^{6,7}

Considering above facts, we undertook the study to know the etiology and clinical profile of COPD in nonsmokers in urban areas.

METHODS

This is an observational cross-sectional study conducted at general medicine and chest Medicine OPDs and wards of a tertiary care hospital for a duration of 18 months after Institutional Review Board permission with a sample size of 60.

Inclusion criteria

- All nonsmoker COPD patients diagnosed by history, clinical examination and spirometry.
- Patient having spent their 70% duration of life in urban areas of Maharashtra.*
- Patients or relatives who gave consent for the study

- Age >18 years.

*Urban area includes Mumbai, Pune, Nagpur, Thane, Nashik, Ahmednagar, Kalyan, Dombivli, Vasai, Virar, New Bombay, Aurangabad, Solapur, Chandrapur, Bhiwandi, Amravati, Nanded, Kolhapur, Sangli, Jalgaon, Akola, Latur, Malegaon, Dhule, Pimpri.

Exclusion criteria

- COPD patients with a history or past history of smoking.
- Patients suffering from chronic lung diseases such as ILD, bronchial asthma, active tuberculosis
- Patients of congestive cardiac failure

Individual patient was asked detailed personal demographic data (age, sex, physical activity and current smoking habits etc.), respiratory symptoms, exposure to passive smoking, family history of COPD and other risk factors pertaining to the study using a case record form. Detailed physical examination including Anthropometric measurements (weight, height and waist circumference) was carried out and other relevant general (vital signs) and systemic examination (RS/ CVS/PA/CNS) was carried out in this study.

Investigations like Hb%, CBC, Blood sugar, kidney and liver function test, lipid profile, ECG, Chest X-ray, CT chest (If required), Spirometry and 2D Echocardiography were carried out in all patients.

Statistical analysis

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS). Determinants for COPD was calculated by multiple logistic regression analysis, in which the independent variables such as age, gender, smoking habits, socio-economic group based on occupation and other risk factors was assessed.

Calculations of odds ratios (ORs), relative risk ratios (RRRs) and 95% confidence intervals (CIs) for COPD with respect to potential risk factors was completed with binary logistic regression and multinomial logistic regression.

RESULTS

Total of 60 patients of non- smoker COPD were studied. The age of the patients was ranging from 18 to 88 years. The maximum number of patients were in the age group between 60- 69 years.

The mean age was 65.7±7.95. There were 39 males and 21 females with gender ratio of 13:7 (Table 1). shows residential urban areas of Maharashtra in non- smoker COPD patients.

Most common symptom was Dyspnea in 100% of patients (MRC Grade 3 being the most common) followed by cough (91.67%).

Table 1: Residential urban areas of Maharashtra in non- smoker COPD patients.

Residence	No. of patients (n=60)	Percentage
Mumbai	36	60
Thane	5	8.33
Vasai-Virar	4	6.67
Kalyan	4	6.67
Jalgaon	3	5
Navi Mumbai	3	5
Bhiwandi	2	3.3
Nashik	2	3.3
Dombivali	1	1.67

Table 2 shows showing frequency of symptoms in non-smoker COPD patients. Most common risk factor for COPD was indoor air pollution (100%) followed by low socioeconomic class (76.67%). All risk factors are summarized in Table 3. Most common signs on examination were rhonchi on auscultation (93.33%) followed by hyper resonance note on percussion (30%). Examination findings are summarized in Table 4.

Table 2: Frequency of symptoms in non-smoker COPD patients.

Symptom	No. of subjects (n=60)	Percentage
Dyspnoea	60	100
Cough	55	91.66
Expectoration	32	53.33
Wheeze	16	26.67
Fever	4	6.67

Table 3: Risk factors for Non- smoker COPD.

Risk Factors	No. of Subjects (n=60)	Percentage
Indoor air pollution	60	100
Low socioeconomic class	46	76.67
Past history of pulmonary tuberculosis	18	30.00
Occupational exposure	17	28.33
Mosquito coils/ vapors	7	11.67
Environmental tobacco smoke exposure	6	10.00
GERD	4	6.67
Smoking by parents during pregnancy	2	3.33
Outdoor air pollution	2	3.33
Recurrent respiratory infections	2	3.33
Obstructive sleep apnea	2	3.33
Family history	2	3.33

Table 4: Frequency of systemic examination findings in non-smoker COPD.

Systemic examination	No. of subjects	Percentage
Rhonchi	56	93.33
Hyper resonance	18	30.00
Obliterated liver dullness	16	26.67
Obliterated cardiac dullness	16	26.67
Crepitation	16	26.67
Loud P2	16	26.67
Reduced chest movements	15	25.00
Reduced Crico-sternal distance	15	25.00
Barrel chest	12	20.00
Accessory muscles	8	13.33
Reduced air entry	6	10.00
Intercostal chest retractions	3	4.84

95% of patients showed evidence of hypoxia on arterial blood gas and 66.67% showed carbon dioxide retention. 70% of patients had a normal ECG and 30% showed evidence of pulmonary hypertension in the form of right ventricular hypertrophy and 'P' pulmonale. 47.33% of patients had an abnormal chest radiograph and most common abnormality was hyperinflation (61.67%). Radiological findings were summarized in Table 5.

Table 5: Chest x-ray abnormalities in non-smoker COPD patients.

Chest radiograph abnormalities	No. of patients (n=60)	Percentage
Hyperinflation	37	61.67
Tubular heart	33	55
Fibrosis	16	26.67
Bullae	1	1.67
Normal	13	21.67

HRCT chest detected abnormality in 80% of cases and most common being air trapping (32.14%). HRCT findings are summarized in Table 6. Two-dimensional echocardiography showed evidence of pulmonary hypertension in 37.5% of patients. 38.33% had moderate FEV/FVC ratio i.e. 50-79% on spirometry. Spirometry findings are summarized in Table 7.

Table 6: Findings on HRCT chest in Non- Smoker COPD patients.

HRCT findings	No. of patients n=56	Percentage
Air trapping	18	32.14
Emphysema	17	30.35
Bronchial dilatation	12	21.4
Bullae	1	1.78
Normal	8	14.2

Table 7: Severity of obstruction on spirometry.

Severity on Spirometry (FEV1/FVC <0.7)	No. of patients n=60	Percent
Mild (FEV1 ≥80)	9	15
Moderate (FEV1 50-79%)	23	38.33
Severe (FEV1 30-49%)	18	30
Very severe (FEV1 <30% or <50%+CRF)	10	16.67

Table 8: Comparison of symptomatology with other studies.

Symptoms	Zhou et al	Kamdar et al	Present study
Dyspnea	48.6%	100%	100%
Cough	45.9%	44%	91.67%
Expectoration	45.6%	34%	53.33%

DISCUSSION

The mean age of the patients in our study was 65.7±7.95 and it is similar to other studied of Bakr RM et al (65.08±5.03) and Zhou et al (65.7±11.3). There was male predominance in our study (65% male) which varies from different studies like Bakr RM et al (58.3% males), Zhou Y et al (88.7% females). It may be due to different geographic area, genetic and environmental factors.^{8,9}

Maximum number of patients i.e. 60% were from Mumbai as the tertiary care hospital is in Mumbai. The most common symptoms in our study group were Dyspnea (100%), followed by cough (91.67%), and sputum production (53.33%), which is similar to other studies (10). Comparative study is shown in table no.⁸

The common risk factors for COPD in nonsmokers in our study were indoor air pollution (100%), low socioeconomic status (76.67%), past history of tuberculosis (30%) and occupational exposure (30%). Among types of indoor air pollutants, maximum exposure was to LPG alone (81.67%), LPG and kerosene (15%), LPG and wood (3.33%). Ekici et al studied 596 non-smoker women in Turkey and found the prevalence of COPD due to biomass smoke to be 23%.¹¹ However, since our study included patients from urban areas, percentage of exposure to biomass fuels was less. When houses are small and poorly ventilated, even males are exposed to biomass smoke. Few studies reported that exposure to toxic gases in the workplace, grain dust in farms, and dust and fumes in factories, occupational exposures in coal Miners, hard-rock miners, tunnel workers, and concrete manufacturers was strongly associated with COPD.²⁻⁴ In NHANES III, Behrendt identified several occupations like plastic, textile, rubber, and leather manufacture; transportation and trucking; manufacture of food products; automotive repair was associated with high prevalence of COPD.¹²

In present study, amongst occupational exposure, maximum patients were cotton mill workers (33.33%) followed by exposure to silica (27.78%) and welding fumes (11.1%). Exposure to mosquito coils and vapors was also a significant factor (28.33%) and less common was recurrent respiratory infections (3.33%), Obstructive sleep apnea (3.33%), family history (3.33%) and outdoor air pollution (3.33%).

Most common sign on examination was Rhonchi (93.33%) and least common was intercostal chest retractions (4.84%). 98.33% of patients had hypoxia and 66.67% had hypercarbia on ABG. 28.33% of patients showed signs of Right heart strain on ECG i.e. P pulmonale + Right ventricular hypertrophy. Hyperinflation was the most common chest x-ray abnormality (61.67%) followed by tubular heart (55%).

Sensitivity of HRCT chest to pick up findings of COPD was 80% in our study which is similar to study conducted by Kamdar et al (75%) and Birring SS et al (80%). Most common finding being air trapping (30%) followed by emphysema (28.3%). 62.5% patients had pulmonary hypertension on 2D echocardiography. On Spirometry, 38.33% of patients had Moderate obstruction and severe obstruction in 30% of patients.^{13,14}

CONCLUSION

Although smoking is the commonest etiology of COPD, etiology other than smoking is equally common and important. Presentation of COPD remain same in smoker and non-smoker which includes Dyspnea, Cough and Rhonchi. Common risk factors for non-smoker COPD are Indoor Air Pollution, low Socioeconomic class and Cotton Mill workers. Amongst indoor pollution, LPG, kerosene and wood are the risk factors for non-smokers COPD in urban population.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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