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# Prevalence of chronic obstructive pulmonary disease among urban males in Chidambaram, Tamil Nadu

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**Abstract**
**Background:** Chronic obstructive pulmonary disease (COPD) is a major public health problem with increasing prevalence especially in developing countries. Different studies show higher prevalence of COPD among men compare to women across the country. Hence this study was undertaken to estimate the prevalence of COPD among men, and to find out the risk factors of COPD among males in Chidambaram.
**Methods**: A community based cross sectional study was done in Chidambaram among males more than 30 years of age. 392 study participants were selected by cluster sampling method. A semi structured questionnaire was used to collect the background information and spirometer was used to measure FEV1 and FVC ratio.
**Results:** The Prevalence of COPD was 15.8% in the study population. Prevalence was significantly higher among older males, smokers and study participants with long duration of ETS and occupational exposure to dust and fumes.
**Conclusions:** There is significant association between COPD and the age, smoking status, long duration of ETS exposure and occupational exposure with p value <0.05. Hence awareness and screening can be carried out among male population.

**Keywords:** COPD, Prevalence, Risk factors, Spirometer

## Introduction
Chronic obstructive pulmonary disease (COPD) is a lung disease that is characterized by a persistent reduction of airflow. The Global Burden of Disease Study reported a prevalence of 251 million cases of COPD globally in 2016. Globally, it was estimated that 3.17 million deaths were caused by the disease in 2015. More than 90% of COPD deaths occurred in low and middle income countries [1]. Globally, the COPD burden is projected to increase in coming decades because of continued exposure to COPD risk factors and aging of the population [2].
In India, three out of five leading causes of mortalities constitute non- communicable diseases. Among NCD's, COPD is the second leading cause of death [3]. Various prevalence studies conducted in Europe and the Americas have reported wide variations in COPD prevalence rates across countries. [4] Many epidemiological surveys have documented the high prevalence of COPD in the general adult population, in both men and women. In fact, the prevalence is consistently higher in men, and increases with advancing age [5].
Different studies have revealed varying range of prevalence of COPD in different states. The prevalence ranged between 2 to 22% among the men and 1.2 to 19% among women in different population-based studies across India [6]. In men, tobacco smoking is found to be the main cause of obstructive pulmonary disease. Other important risk factors associated with COPD are outdoor air pollution, occupational exposure to dusts and fumes, biomass smoke inhalation, exposure to second-hand smoke and previous tuberculosis [7].
The aim of the present study is to find out the prevalence of chronic obstructive pulmonary disease among male aged 30 years and above in urban population of Chidambaram and to find out the association between COPD and selected known risk factors.

## Materials and methods
A community based cross sectional study was carried out from June 2018 to December 2018.The present study was done in urban Chidambaram which is the field practice area

under urban health center, RMMCH. It consists of 32 wards, with a total population of 62000 and approximately 15000 households. The study population consisted of males more than 30 years of age residing in urban area. The sample size was calculated as 392 based on previous studies [8, 9] The exclusion criteria were those not willing to participate, those with pulmonary tuberculosis, heart disease and those who had history of surgery in the abdomen, chest or eye in the past 3 months.

Ethical clearance was obtained before conducting the study from Institutional Ethical committee, RMMCH. Data collection was done by house to house visits. Households who met the Inclusion and exclusion criteria were interviewed using questionnaire [12]. Informed consent was obtained from all the study participants after explaining the study procedures in native language.

A semi structured questionnaire was used to collect the data, the variables included were sociodemographic details, symptoms of respiratory system and risk factors for COPD. To assess the risk of COPD, International Primary Care Respiratory Group (IPCRG) Guidelines for COPD was used [10]. A portable spirometer – "Spirobank" which met the quality standard of ATS/ERS task force guidelines was used to measure forced expiratory volume in the first second/forced vital capacity of the lung. The spirometry was done only in those with symptoms compatible with COPD namely, dyspnoea, wheeze, chronic cough, sputum production with the screening risk score of 17 and above to confirm the presence of persistent airflow limitation. Separate mouthpiece was used for each subject. COPD was defined as a prebronchodilator FEV1: FVC ratio less than 70% based on 2017 GOLD guidelines [2].

Smokers were classified into the current smoker, who smokes≥1 cigarette/beedi per day for the last 1year, ex-smoker, who either stopped smoking or is taking <1 cigarette/beedi per day for the last 1 year and nonsmoker who never smoked or had smoked <100 cigarette/beedi in lifetime. Pack- years of smoking was calculated by multiplying number of packs of cigarettes or beedi smoked per day by the number of years the person smoked [11].

ETS exposure is defined as passive smoke exposure to one or more smoker at home or workplace. Occupational exposure is considered as exposure to dust, smoke, fumes, or gas in the workplace. Duration of exposure was obtained from a history of the duration in years.

Patients with FEV1/FVC (forced expiratory volume in the first second/forced vital capacity) ratio of less than 0.7 are considered to have airway obstruction [2]. All chest symptomatic including patients of COPD were referred to tertiary care centre for check-up.

Data collected were entered in MS excel sheet 2019 and data analysis was carried out using SPSS 23 software. Descriptive and inferential statistics were employed. All the qualitative variables were expressed in percentages, chi-square test was applied to find out the association between risk factors and COPD. Those factors which are significant after applying chi-square test were included in multivariate logistic regression model and adjusted odds ratio was calculated.

## Results

A total of 392 male participants were selected for this study. out of 392 study participants 77.3% and 22.7% were aged <60 and >60 years respectively. 41.33% and 27.30% of the study participants belong to the lower middle and upper lower socio-economic class according to modified Kuppusamy scale 2018 respectively.75% of the study participants had a positive family history of allergy.80.1% of the households did not have adequate cross ventilation and 54.85% of households were overcrowded.

Among the study population 47.19% of the participants were current smokers of which 27.81% were cigarette smokers and 27.55% of the study participants had >10 pack years of smoking. Also, 27.04% of the participants were exposed to environmental tobacco smoke of which 11.99% were exposed for more than 10 pack- years. 57.4% were exposed to occupational dust and fumes; of them 10.46% were exposed for more than 10 years (table 1).

Out of 392 study subjects, 162(41.3%) had symptoms suggestive of COPD according to IPCRG guidelines out of which 62 subjects had spirometry confirmed COPD. Hence the prevalence of the COPD among men above 30 years of age was 15.8% (fig 1).

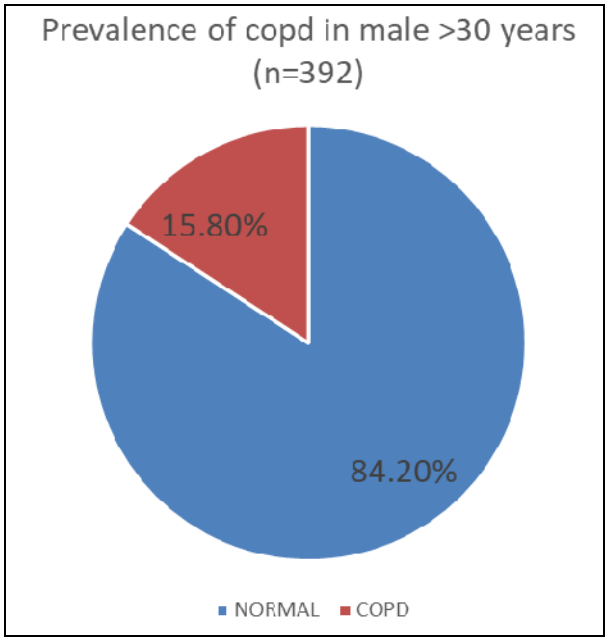


**Fig 1:** Prevalence of the COPD in males above 30 years of age.

In the present study, the prevalence of COPD was found to be 10.5%,6.5% 25.6% and 24.7% in the age group 30-39, 40-49, 50-59 and >60 years respectively. According to SES class, the prevalence of COPD in the upper middle, lower middle and upper lower were found to be 7.3%,18.5% and 21.5% were respectively. In Subjects with positive family history of allergy the prevalence of COPD was found to be 15.5%. In the subjects living in overcrowded and poorly ventilated houses, the prevalence of COPD was found to be 19.2% and 12.8% respectively. This study shows significant association between age, socioeconomic status and COPD. There was no significant association between COPD and family history of allergy, overcrowding and cross ventilation (table 2).

The present study found a significant association of COPD with smoking status and duration of ETS exposure and number of pack years smoked. Also, duration of exposure to occupational dust and fumes was found to be significantly associated with COPD. The prevalence of COPD was found to be 22.7% among current smokers. In subjects with more

than 20 pack years of smoking and cigarette- smokers COPD prevalence was found to be 31.9% and 24.5% respectively. 16% prevalence was found among subjects who had exposure to environmental tobacco smoke and prevalence was increased to 71.4% with subjects exposed to ETS more than 20 years of duration. 58.3% of COPD was found among subjects with positive history of occupational exposure to dust and fumes for more than 20 years (table 3).

**Table 1:** Distribution of study participants according to Smoking status and smoke exposures

| Variable | Category | Frequency n=392 | Percentage |
|---|---|---|---|
| Smoking status | Non-smoker | 161 | 41.07 |
| | Ex-smoker | 46 | 11.73 |
| | Current smoker | 185 | 47.19 |
| Substance smoked | No substance | 161 | 41.07 |
| | Beedi | 129 | 32.91 |
| | Cigarette | 109 | 27.81 |
| No of Pack years | No exposure | 161 | 41.07 |
| | <10years | 123 | 31.38 |
| | 11 – 19 years | 61 | 15.56 |
| | ≥20 years | 47 | 11.99 |
| ETS exposure | Present | 107 | 27.30 |
| | absent | 285 | 72.70 |
| ETS duration | No exposure | 285 | 72.70 |
| | <10years | 60 | 15.31 |
| | 11 – 19 years | 40 | 10.20 |
| | ≥20 years | 7 | 1.79 |
| Occupational exposure to dust & fumes | Present | 225 | 57.40 |
| | Absent | 167 | 42.60 |
| Duration of occupational exposure | No exposure | 174 | 44.39 |
| | <10 years | 124 | 31.63 |
| | 11 to 19 | 17 | 4.34 |
| | >20 years | 24 | 6.12 |

Stepwise logistic regression was carried out as COPD present/absent as dependent variable and age, socioeconomic status, family history of allergy, overcrowding, cross ventilation, smoking status, substance smoked, number of pack years of smoking, ETS exposure, occupational exposure to dust and fumes and duration of exposure as independent variables. Age, socioeconomic status, smoking status, substance smoked, pack years of smoking, ETS exposure duration and occupational exposure duration were categorized and compared with the 1st category.

The stepwise logistic regression had identified, age, duration of ETS exposure, socioeconomic status and substance smoked as the most significant variables. For the variable age, the adjusted odds ratio was 6.5 for men above 60 years old which indicates that the risk of developing COPD is 6.5 times higher for the men above 60 years old compared to men between 30-39 years old.

Similarly, men in the upper lower socioeconomic status group had 11.5 times higher risk of developing COPD compare to upper middleclass men. In subjects, more than 20 years of exposure to ETS, the risk of developing COPD was 11.8 times higher than the subjects of no exposure to ETS. The present study also identified that the risk of developing COPD was 12.7 times higher for subjects smoked cigarette alone compared to non -smokers (table 4).

**Table 2**: Association between demographic characters and COPD

| Variable | | COPD | | | | Chi-square | P-value |
|---|---|---|---|---|---|---|---|
| | | Yes | | No | | | |
| | | N=62 | Percent | N=330 | Percent | | |
| Age | 30-39 | 12 | 10.5 | 102 | 89.5 | 20.51 | <0.001 |
| | 40-49 | 7 | 6.5 | 100 | 93.5 | | |
| | 50-59 | 21 | 25.6 | 61 | 74.4 | | |
| | >60 | 22 | 24.7 | 67 | 75.3 | | |
| Socioeconomic status | UM | 9 | 7.3 | 114 | 92.7 | 10.15 | 0.006 |
| | LM | 30 | 18.5 | 132 | 81.5 | | |
| | UL | 23 | 21.5 | 84 | 78.5 | | |
| Family history of Allergy | Present | 15 | 15.5 | 82 | 84.5 | 0.01 | 0.528 |
| | Absent | 47 | 15.9 | 248 | 84.1 | | |
| Over crowding | Present | 34 | 19.2 | 143 | 80.8 | 2.79 | 0.095 |
| | Absent | 28 | 13.0 | 187 | 87 | | |
| Cross ventilation | Present | 52 | 16.6 | 262 | 83.4 | 0.65 | 0.418 |
| | Absent | 10 | 12.8 | 68 | 87.2 | | |

COPD- Chronic Obstructive Pulmonary Disease, UM- Upper middle, LM- Lower middle, UL- Upper lower

## Discussion

In the current study, the overall prevalence of the COPD among men above 30 years of age was 15.8% which is comparable to the study done by Satoru Fukuyama *et al*. of 14.6% [8]. In contrast a study conducted by Mohamed Saleem *et al*. reported a higher prevalence of 39.2% [13].

Another study done by P. A. Mahesh *et al*. reported prevalence of 11.1% [14]. The observed difference in the prevalence among study population may be due to the differences in cultural practices and sociodemographic characteristics of people across the country.

In the present study, the prevalence of COPD in men aged 60 years and above was 24.7%. Males aged more than 60 years were found to have six times increased risk of developing COPD than men in 30-39 years age group, which is similar to the findings of Sinha B *et al*. [15]

59% of the study population are current and ex-smokers, of them 27.8% were cigarette smokers. We observed that COPD was highest in cigarette smokers (24.5%) and the risk of developing COPD among cigarette smokers were 12 times higher than non-smokers. This may be due to higher dose of tobacco inhalation associated with cigarette smoking which is similar to the previous studies [16-18]

ETS exposure was present in 27.3% of study population, of them 16% found to have COPD. Prevalence of COPD among persons exposed to ETS for more than 20 years was 71.4% which is statistically significant, and risk of developing COPD is 11.8 times higher than ETS non-exposed persons. Exposure to ETS was significantly associated with higher odds of COPD in this study. This finding is in accordance with INSEARCH multicentric study [14] and a review of the health effects of ETS.[19] where an increased risk of COPD was found.

27.3% of study population belong to upper lower class of socioeconomic status. Among them 21.5% had COPD. Risk of developing COPD in this category was 11.5 times higher than persons belonging to upper middle class of SES. Study done by Mathew grigby *et al*. found that low socioeconomic status as a risk factor for developing COPD [20]

**Table 3**: Association between smoking status, smoke exposures and COPD

| Variable | | COPD | | | | Chi-square | P-value |
|---|---|---|---|---|---|---|---|
| | | Yes | | No | | | |
| | | N=62 | Percent | N=330 | Percent | | |
| Smoking status | Non-smoker | 17 | 10.6 | 144 | 89.4 | 12.916 | **0.002** |
| | Ex-smoker | 3 | 6.5 | 43 | 93.5 | | |
| | Current smoker | 42 | 22.7 | 143 | 77.3 | | |
| Substance smoked | No substance | 17 | 10.6 | 144 | 89.4 | 12.073 | **0.007** |
| | Beedi only | 20 | 15.5 | 109 | 84.5 | | |
| | Cigarette | 25 | 24.5 | 77 | 75.5 | | |
| Pack years | No exposure | 17 | 10.6 | 144 | 89.4 | 17.229 | **0.001** |
| | <10years | 15 | 12.2 | 108 | 87.8 | | |
| | 11 – 19 yrs | 15 | 24.6 | 46 | 75.4 | | |
| | ≥20 years | 15 | 31.9 | 32 | 68.1 | | |
| ETS exposure | Present | 18 | 16.0 | 89 | 84.0 | 0.005 | 0.942 |
| | absent | 44 | 15.7 | 241 | 84.3 | | |
| ETS duration | No exposure | 44 | 15.4 | 241 | 84.6 | 24.096 | **<0.001** |
| | <10years | 3 | 5.0 | 57 | 95.0 | | |
| | 11 – 19 | 10 | 25.0 | 30 | 75.0 | | |
| | ≥20 years | 5 | 71.4 | 2 | 28.6 | | |
| Occupational exposure to dust & fumes | Present | 40 | 17.8 | 185 | 82.2 | 1.526 | 0.217 |
| | Absent | 22 | 13.2 | 145 | 86.8 | | |
| Duration of occupational exposure | No exposure | 27 | 15.5 | 147 | 84.5 | 38.192 | **0.001** |
| | <10 years | 10 | 8.1 | 114 | 91.9 | | |
| | 11 to 19 | 11 | 15.7 | 59 | 84.3 | | |
| | >20 years | 14 | 58.3 | 10 | 41.7 | | |

**Table 4:** Multivariate logistic regression analysis of risk factors of COPD.

| Factors (n= 392) | Category | Adjusted odds ratio | 95% Confidence interval | P-value |
|---|---|---|---|---|
| Age | 30-39 | 1 | | |
| | 40-49 | 0.559 | 0.16-1.94 | 0.360 |
| | 50-59 | 3.02 | 0.89-10.25 | 0.076 |
| | >60 | 6.55 | 2.08-20.65 | **0.001*** |
| Duration of environmental tobacco smoke | No exposure | 1 | | |
| | <10 years | 0.29 | 0.08-1.04 | 0.058 |
| | 11-19 years | 2.89 | 0.99-8.49 | 0.052 |
| | >20 years | 11.84 | 1.51-93.11 | **0.019*** |
| Socio economic status | Upper middle | 1 | | |
| | Lower middle | 6.21 | 1.84-20.93 | 0.003 |
| | Upper lower | 11.51 | 3.29-40.25 | **<0.001*** |
| Substance smoked | No substance | 1 | | |
| | (Non-smoker) | 2.15 | | |
| | Beedi only | 12.76 | 0.73-6.30 | 0.164 |
| | Cigarette | | 4.19-38.83 | **<0.001*** |

**Limitations**

Spirometry was performed only in symptomatic subjects based on IPCRG questionnaire. Reversibility test using bronchodilator was not performed. Since reversibility testing was not conducted, certain conditions like Asthma could not be excluded, so the prevalence of the COPD may be overestimated.

**Conclusion**

The prevalence of COPD was 15.8%. There was a significant association between smoking and duration of ETS exposure. Smoking and ETS exposures are major preventable risk factors for the disease in the study area. Hence intervention such as health promotion, early detection of COPD in high risk individuals are needed to reduce the disease burden.

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**Conflict of interest:** None declared
**Ethical approval:** The study was approved by the Institutional Ethics Committee

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