



Correlation of haematocrit and smoking score with severity of Chronic obstructive pulmonary disease

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ABSTRACT

Chronic obstructive pulmonary disease (COPD) is currently the 4th leading cause of death all over the world. Smoking is by far the most important documented and preventable cause for COPD. We performed this study to identify the correlation of haematocrit and smoking score in pack years with severity of COPD. The study included 111 spirometry-confirmed COPD patients defined by the GOLD criteria from a tertiary care hospital in south India. They underwent detailed medical history and dyspnoea grading. Smoking status of the patient was noted and the severity of COPD was assessed according to GOLD classifications. All selected patients were subjected to blood investigations, chest Xray and ECG. 111 COPD patients were included in this study with mean of 57.48 ± 5.93 years. Among the study group large percentage of smokers (70.3%) used beedi. Polycythemia was detected in 97% of patients. Smoking in pack years also showed a close and significant relation to severity of COPD. Correlation between polycythemia with smoking score analyzed and Pearson chi-square value is 35.5. Haematocrit of all patients has gone above normal and was very high in heavy smokers. Fall in FEV1 was directly proportional to the pack years. Oxygen saturation of the smokers had a dramatic decrease with p value 0.019. There were significant correlation of smoking pack years with severity of airflow obstruction and oxygen desaturation. The onset of symptoms of COPD and the risk for polycythemia were also related to pack years.

Key words: COPD, Haematocrit, smoking

Abbreviations :

COPD : Chronic obstructive pulmonary disease

ECG : Electrocardiogram

WHO: World Health Organization

MMRC :Modified medical research council dyspnea scale

SpO₂ : Oxygen saturation

FVC : Forced vital capacity

FEV1: Forced expiratory volume in first second

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a major cause of chronic morbidity and mortality throughout the world. Many people suffer from this disease for years and die prematurely from it or due to its complications. COPD is the fourth leading cause of death in the world, and further increases in its prevalence and mortality can be predicted in the coming decades [1]. COPD is defined as, a common preventable and treatable disease, is characterised by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases. Exacerbations and comorbidities contribute to the overall severity in individual patients [2].

Long term exposure to lung irritants that damage the lungs and airways usually is the cause of COPD. Worldwide, the most commonly encountered risk factor for COPD is tobacco smoking (3,4,5). Studies show that approximately 80-90% of patients with COPD have been smoking and approximately 15% of all smokers are yet to develop COPD

(6). Non-smokers may also be at risk for developing COPD as a consequence of passive smoking, indoor and outdoor air pollution or occupational dusts and chemicals(7,8).

There are approximately 120 million smokers in India. According to the World Health Organization (WHO), India is home to 12% of the world's smokers. Jha *et al.* have estimated that around 1 million deaths a year in India will be attributable to smoking by the early 2010s.[9] . According to the National Family Health Survey (NFHS)-3 , conducted in 2005–06, tobacco use is more prevalent among men, rural population, illiterates, poor and vulnerable section of the society.[10]

The hematocrit is often elevated in patients who have a PaO₂ less than 55 mm Hg or in patients who have nocturnal desaturation. COPD has long been recognized as an important cause of secondary polycythemia. When present in COPD, polycythemia can contribute to the development of pulmonary hypertension, and leads to pulmonary endothelial dysfunction, reduced cerebral blood flow, hyperuricemia and gout, and increased risk of venous thromboembolic disease.[11-14]

AIM OF THE STUDY

Correlation of haematocrit and smoking score (in pack years) with severity of COPD.

MATERIALS AND METHODS

This study was conducted on randomly chosen COPD patients aged from 45 to 65 years, in a territory care hospital, Kerala . Before commencement of study, approval was taken from the Institutional Ethical Committee.

Study design: Prospective clinical study.

Period of study: 1 Year.

Inclusion Criteria

This study includes patients who admitted with clinical diagnosis of COPD with a FEV1/vital capacity (FVC) ratio <70% and a FEV1 <80% of predicted.

Exclusion Criteria

- Patients who had active pulmonary tuberculosis, bronchiectasis, malignancies and bronchial asthma
- Patients who had complications of COPD like pneumonia, pneumothorax and suspected pulmonary embolism
- Age above 65years & seriously ill patients excluded due to the poor compliance to perform pulmonary function tests.
- Patients who had symptoms of less than two years

Study Design:

The diagnosis of COPD was established based on a medical history of smoking, current symptoms of cough, dyspnea or sputum production and available standard pulmonary function test which was performed by spirometry according to the ATS standards (American Thoracic Society). The severity of COPD was assessed according to GOLD classifications.

Dyspnoea was graded according to the MMRC [Modified medical research council dyspnea] scale.(table1). Smoking status of the patient was noted and pack year was calculated using a formula (BTS guidelines)

$$= (\text{No. of cigarettes smoked / day} \times \text{years of smoking}) / 20$$

The patient smoking score was recorded and classified in to four groups of which

1. Less than 20pack years
2. 21 – 50 pack years
3. 51 – 100 pack years
4. More than 100 pack years

All selected patients were subjected to investigations including complete blood count, Erythrocytic sedimentation rate (ESR), blood sugar, renal function test, sputum evaluation (Macroscopy, Microscopy, AFB stain), X-ray chest postero anterior view, ECG, pulse oximetry, spirometry & reversibility to bronchodilators.

CT scan was done in 2 cases of bullae to know the extend of the disease and feasibility of surgery.

Analysis

Data were described as means \pm standard deviation. In order to evaluate the correlation between parametric variables, the Pearson's chi-square value was utilized. Data analysis was performed using SPSS version 16 software. $P < 0.05$ was considered statistically significant

RESULTS

111 COPD patients were included in this study; 109 males and 2 females, their ages ranged between 45 and 65 years with mean \pm standard deviation (SD) of 57.48 ± 5.93 years. There is high frequency (63%) of COPD patients among age group of 56-65 years.

Among the study group large percentage of smokers (70.3%) used beedi (table 2). This may be due to less expense, occupational association, availability and false belief that beedi is less dangerous than the cigarette.

Polycythemia was detected in 97% of patients. Correlation between polycythemia with smoking score analyzed and Pearson chi-square value is 35.5.(table 3)

Less than 20 pack years patients had 75 % moderate stage and 25% severe stage COPD. 21-50 pack years had 14% moderate, 83.6% severe and 1.5% very severe stage of COPD. 51-100 pack years group had 2.8% moderate, 77.8% severe and 19.4% very severe diseases. More than 100 pack year group 50% presented with severe and 50% with very severe COPD. Smoking in pack years also showed a close and significant relation to severity of COPD.(table 4)

Haemoglobin was higher than normal in all 111 smoker COPD patients in the study. The p values is 0.000 which significant at 0.01 level. Haematocrit of all a patients has gone above normal and was very high in heavy smokers. The p value is 0.000 which was significant is at 0.01 levels. ESR was decreased when the pack years increased in all patients and p. value was 0.005. ECG was taken in 110 cases and P wave was elevated (P pulmonale) in heavy smokers with p value of 0.006.

Fall in FEV1 was directly proportional to the pack years. P value was 0.046 which was significantly 0.05 levels. SpO₂ (Oxygen saturation) of the smokers had a dramatic decrease with p value 0.019. (table 6). Hb, PCV and P Wave showed positive deflection. ESR, FVC, FEV1 and SaO₂ showed negative deflection.

DISCUSSION

Even though COPD is declining in developed countries due to cessation of smoking and proper health education, the same is not true with developing countries.

India contributes a significant and growing percentage of COPD mortality which is estimated to be amongst the highest in the world; i.e. more than 64.7 estimated age standardized death rate per 100,000 amongst both sexes. This would translate to about 556,000 in case of India (>20%) out of a world total of 2,748,000 annually.[15]

This study also shows that eventhough there is an increased awareness about the hazards of smoking among people including smoking cessation clinics, legal restrictions, media wise advise and health education strategies, smoking has not much decreased in the general population. The study shows 40% persons started smoking below 15yrs. 3.6% with more than 100 pack years and these group presented with very severe COPD. According to WHO statistics 80% of smokers begins smoking before the age of 18yrs.

In this study it was found that 67.6% of the smokers were using beedi. 29.7% were cigarette smoking and 2.7% both. An another study by Dhandel et al shows 52% of beedi smokers in India compared to cigarette smokers. In our country, beedi smoking is an important factor in addition to cigarette smoking that causes COPD. [16]. Studies showed population attributable fraction for smoking as a cause of COPD ranged from 9.7 to 97.9 per cent[17]. A Swedish cohort study had observed that population-attributable fraction for smoking as a cause of COPD was 76.2 per cent[18]. In another Denmark study, the reported population attributable fraction as a cause of COPD was 74.6 per cent[19].

Mean number of years taken for onset of symptoms from the onset of smoking was 7 years. This study showed there is a direct relationship between cigarette smoked as in terms of pack years and onset of symptoms. The smoking will favour an early onset of COPD especially if smoking score is more than 50 pack years. The severity of the disease

is directly proportionate to the smoking score. Incidentally we noticed that smoking cessation is difficult in these patients even after knowing all the consequences of smoking and after attending smoking cessation clinics . Smoking score has a direct influence on the Haematocrit of the patient. Pack years above 20 had shown evidence of polycythemia. Pack years of 50 or above showed packed cell volume of 58 to 60%. Previous studies also showed the significant correlation between increase in haematocrit and Hb in smoker groups by Stonesifer LD[20] and Jackson DV et al[21].

Table 1
The Modified Medical Research Council (MMRC) Dyspnoea Scale

Grade of dyspnoea	Description
0	Not troubled by breathlessness except on strenuous exercise
1	Shortness of breath when hurrying on the level <i>or</i> walking up a slight hill
2	Walks slower than people of the same age on the level because of breathlessness <i>or</i> has to stop for breath when walking at own pace on the level
3	Stops for breath after walking about 100 m <i>or</i> after a few minutes on the level
4	Too breathless to leave the house <i>or</i> breathless when dressing or undressing

Table 2: Distribution of beedi cigarette and both among study population

		Cigarette		Total	
		No	Yes		
Beedi	No	Count % of Total	33 29.7%	33 29.7%	
	Yes	Count % of Total	75 67.6%	3 2.7%	78 70.3%
Total		Count % of Total	75 67.6%	36 32.4%	111 100.0%

Table 3: Catagorisation of age groups and smoking pack years

		AGE – 1				Total
		45-50	51-55	56-60	61-65	
Pack 1	1 - 20	3 75.0%	1 25.0%			4 100.0%
	21 - 50	15 22.4%	13 19.4%	22 32.8%	17 25.4%	67 100.0%
	51 - 100	4 11.1%	5 13.9%	9 25.0%	18 50.0%	36 100.0%
	100 & Above			2 50.0%	2 50.0%	4 100.0%
		22 19.8%	19 17.1%	33 29.7%	37 33.3%	111 100.0%

Table 4: Polycythemia correlation with smoking score (Pack years)

		Polycythemia		Total	
		No	Yes		
1-20		Count %	2 50.0%	2 50.0%	4 100.0%
Pack Yrs	21-50	Count %	1 1.5%	66 98.5%	67 100.0%
	51-100	Count %		36 100.0%	36 100.0%
	100 & Above	Count %		4 100.0%	4 100.0%
Total		Count %	3 2.7%	108 97.3%	111 100.0%

	Value	Df	Asymp. Sig (2 Sided)
Pearson Chi-Square	35.512	3	.000

Table5: Severity COPD and association of smoking

		Severity				Total
		2	3	4		
Pack Yrs	1-20	Count %	3 75.0%	1 25.0%		4 100.0%
	21-50	Count %	10 14.9%	56 83.6%	1 1.5%	67 100.0%
	51-100	Count %	1 2.8%	28 77.8%	7 19.4%	36 100.0%
	100 & Above	Count %		2 50.0%	2 50.0%	4 100.0%
Total		Count %	14 12.6%	87 78.4%	10 9.0%	111 100.0%

Table 6: correlation between smoking score and onset of symptoms.

		Pack Year	Onset of Symptoms
Pack year	Person correlation sig (2-tailed) N	1.000	0.232
Onset of symptoms	Person correlation sig (2-tailed) N	0.232 0.014 111	1.000 111

Present study found that there was significant correlation of smoking pack years with severity of airflow obstruction and oxygen desaturation.

CONCLUSION

From the present study it was concluded that:

- FEVI & FVC is declined in smokers and is proportional to smoking score.
- Oxygen desaturation was directly related to smoking score.
- There was direct correlation between pack years and the onset of symptoms of COPD
- The risk for polycythemia is also related to pack years.
- 67.3% of the smokers use beedis and most of them believe that beedi is less harmful than cigarette. Socio economic status also contribute to selection of beedis

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