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General Medicine

EARLY DETECTION OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE IN ASYMPTOMATIC SMOKER'S USING SPIROMETRY

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ABSTRACT Early detection of chronic obstructive pulmonary disease in asymptomatic smokers by using spirometry an observational study the effect of screening spirometry in smoking cessation, delaying the onset of severe COPD, preventing morbidity and mortality, and ultimately decreasing the prevalence of COPD. In the present study it was observed that, out of a total of 370 subjects, 175 were more than 40 years of age which constitute around 47.29%, where as those who are less than or equal to 40 years age constituted a 52.70%. The mean age was 40.14 ± 5.47. Overall the mean smoking index in 370 subjects was 300.55 ± 219.48. In subjects > 40 years of age mean SI was 371.88 ± 249.49 and in subjects ≤40 years it was 326.53 ± 164.59. Overall airway obstruction was seen 42 subjects i,e., 11.35%. Mild obstruction (GOLD stage 1) was seen in 31 subjects which corresponds to 73.80%.Moderate obstruction (GOLD stage 2) was seen in 11 subjects which constitutes 26.19%. Airway obstruction was noticed in 24 subjects out of a total of 121 subjects with smoking index >200, which corresponds to 19.8%. In smokers more than 40 years of age and with smoking index less than 200 (n=97), 10 had mild obstruction (GOLD 1) and 1 had moderate obstruction. In smokers less than 40 years of age and smoking index more than 200 (n=43), 4 had mild obstruction and 2 had moderate obstruction. In smokers more than 40 years of age and with smoking index more than 200 (n=78), 10 had mild obstruction (GOLD 1) and 8 had moderate obstruction. In smokers less than 40 years of age and smoking index less than 200 (n=152), 7 had mild obstruction.

KEYWORDS : Chronic Obstructive; Pulmonary Disease, Forced expiratory volume at 1 Second Asymptomatic Smoker's, spirometry.

INTRODUCTION

COPD is the leading cause of chronic morbidity and mortality worldwide, which induces a major social and economic burden that is both substantial and increasing[1].

It is currently the 4th leading cause of death in the world but, is projected to be the 3rd leading cause of death by 2020[2]. More than 3 million people died of COPD in 2012 which constitutes 6 % of the deaths globally[2].

The burden of COPD is projected to increase in the coming decades due to continued exposure to COPD risk factors and the changing age structure of the world's population. Meta analysis of population based studies from India suggests prevalence of COPD to be 5% in males and 2.7% in females above 30 years of age[3,4] .

The Lung Health Study showed that when patients with mild to moderate COPD quit smoking, their lung function declined only slightly over the next 5 years [5].

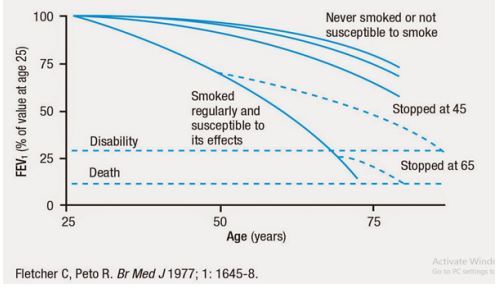
Since smoking cessation in early COPD is found to reduce rapid decline of ventilatory function in smokers, [6,7] its early detection in asymptomatic smokers is also likely to motivate smokers to make an attempt to quit smoking thereby halting its progression to severe stage .

Early diagnosis of COPD should provide support for smoking cessation initiatives and lead to reduction of the societal burden of the disease, but definitive confirmation of both proves elusive[8]. FEV1 and FVC predict all cause mortality independent of tobacco smoking.

However there are no data to indicate that screening spirometry is effective in directing management decisions or in improving COPD outcomes in patients who are identified before developing significant symptoms[9].

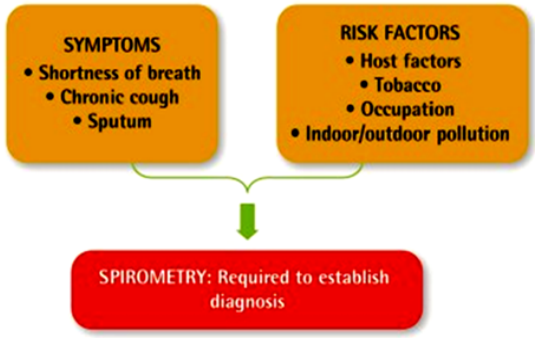
The landmark study of Fletcher and Peto on the natural history of tobacco smoke-related chronic airflow obstruction suggested that decline in the FEV_1 in COPD is slow at the beginning, becoming faster with more advanced disease[10].

MODIFIED FLETCHER AND PETO GRAPH



Fletcher C, Peto R. *Br Med J* 1977; 1: 1645-8.

DIAGNOSIS AND INITIAL ASSESSMENT



Dyspnoea: - Dyspnoea, a cardinal symptom of COPD, is a major cause of the disability and anxiety that is associated with the disease. Chronic cough is the most common symptom which is frequently discounted by the patient as a consequence of smoking. Chronic cough in COPD may be productive or non productive[11]

Pulmonary function tests

PFT is a generic term used to indicate a battery of manoeuvres that are performed using standardized equipment to measure lung function. PFT's can include simple screening spirometry, formal lung volume measurement, diffusing capacity for carbon monoxide, and arterial blood gases. These studies may collectively be referred to as a complete pulmonary function survey.

In theory, primary care physicians can identify undetected COPD by screening asymptomatic individuals or by targeting a high-risk asymptomatic population using screening spirometry, followed by confirmatory diagnostic spirometry in primary care or pulmonary specialty clinics[12]

Current clinical practice guidelines recommend against screening for COPD in asymptomatic patients; however, many professional organizations recommend case-finding among patients presenting with respiratory symptoms associated with the disease, such as dyspnea, chronic cough, or sputum production[13].

AIMS and OBJECTIVES OF THE STUDY

1) Early detection of COPD in asymptomatic smokers using spirometry.
2) Encourage and initiate necessary smoking cessation measures to delay the progression of the disease and reduce exacerbations of the disease.
3) To find out correlation between age, smoking index and airflow limitation.

MATERIAL AND METHODS

Presuming an average prevalence of 25.43% based on previous studies of early detection of COPD in asymptomatic smokers, sample size was calculated as per the formula 4 pq/l2 (where P being the prevalence=1-P and l= allowable error around the prevalence).Considering 5% error at 95% confidence interval, the required sample size was to be a minimum of 303. With 20% non response rate, it was estimated to be 363.

Type of study: cross sectional descriptive study in high risk population screening in Out Patients and In Patients of Osmania General Hospital, Hyderabad.

INCLUSION CRITERIA:

1) Regular male smokers.
2) 30 years of age and above with no significant respiratory symptoms except for occasional cough and willing to undergo spirometry.

EXCLUSION CRITERIA:

1) Subjects with smoking cessation for one year or more before enrolment, with history suggestive of bronchial asthma, tuberculosis and on bronchodilators or inhaled corticosteroids.

All these subjects were subjected to spirometry using portable spirometer (RMS Helios 401). Spirometry was performed by an experienced respiratory technician as per the recommendations of American Thoracic Society[14] FVC,FEV1 and FEV1% were measured after administration of 400 µg of salbutamol as per the guidelines given by GOLD. Based on spirometry, subjects were classified as having mild COPD (FEV1/FEVC<0.70, FEV ≥80%of predicted normal value), moderate COPD (FEV1/FVC<0.70, FEV1 50-80% of predicted normal value), severe COPD (FEV1/FVC <0.70, FEV1 30-50% of predicted normal value) and very severe COPD (FEV1/FVC <0.7, FEV1 ≤ 30) as per GOLD guidelines. Subjects with abnormal spirometry were advised to report to our respiratory centre for further evaluation and joining smoking cessation programmes.

STATISTICAL ANALYSIS

Descriptive statistics were calculated using means ± SD. The chi-square test was applied for categorized data to find out the significance.

OBSERVATIONS & RESULTS

TABLE: 1 - AGE DISTRIBUTION

Age ranges	Number	percentage
31-35	94	25.4
36-40	101	27.3
41-45	101	27.3
46-50	74	20

In the present study the minimum age was 31 years and maximum age was 50 years. age distribution in ranges

TABLE: 2 - Comparison of mean SI with age group

Age group	Mean smoking index	N %
>40 years	371.88 ± 249.49	175 (47.29)
≤40 years	326.53 ± 164.59	195 (52.70)

Overall the mean smoking index in 370 subjects was 300.55 ± 219.48. In subjects >40 years of age mean SI was 371.88 ± 249.49 and in subjects ≤40 years it was 326.53 ± 164.59.

AIRWAY OBSTRUCTION:

Overall airway obstruction was seen 42 subjects i,e 11.35%. Mild obstruction (GOLD stage 1) was seen in 31 subjects which corresponds to 73.80%.Moderate obstruction (GOLD stage 2) was seen in 11 subjects which constitutes 26.19%.

TABLE :3 - Comparison of severity of obstruction with age and smoking index:

age	Smoking index	Airway obstruction total	Mild obstruction (GOLD 1)	Moderate obstruction (GOLD 2)
≤40	>200	6	4	2
≤40	≤200	7	7	0
>40	>200	18	10	8
>40	≤200	11	10	1
total		42	31	11

In smokers more than 40 years of age and with smoking index less than 200 (n=97), 11 (11.34%) had obstruction and in smokers less than 40 years of age and smoking index more than 200 (n=43), 6(13.9%) had obstruction (p<0.005).

In smokers more than 40 years of age and with smoking index more than 200 (n=78), 10 had mild obstruction (GOLD 1) and 8 had moderate obstruction . in smokers less than 40 years of age and smoking index less than 200 (n=152), 7 had mild obstruction.

TABLE : 4 - Mean FEV 1,FVCand FEV1/FVC :

Spirometric parameters	mean	±SD
FEV1	3.8	0.38
FVC	4.8	0.35
FEV1/FVC	77.60	6.32

DISCUSSION

A total of 370 individuals who met the inclusion criteria were evaluated with spirometry compared with the study by *Barthwal et al*, where 460 individuals were evaluated. All the subjects were male with mean age of 40.14 ± 5.47 compared to the study by Barthwal where mean age was 39.72±8.76.

Early detection of COPD in asymptomatic smokers:

Early diagnosis of COPD with spirometry should provide support for smoking cessation initiatives and lead to reduction of the societal burden of disease, but there are no confirmative data available for the same. In Finland 1998. The Finnish National Programme for Chronic Bronchitis and COPD, 1998–2007 followed the same. Smoking decreased in males from 30% to 26% (p<0.001) and in females from 20% to 17% (p<0.001). By 2003, decline in smoking prevalence and admissions for COPD.

Spirometry v/s questionnaire in early diagnosis of COPD

In DIDASCO Study (Differential Diagnosis between Asthma and COPD),a population based study, use of a spirometer is mandatory if early stages of COPD are to be detected in general practice.

Prevalence of COPD :

Most of Indian studies have screened population for COPD above 30 years of age[15]

The overall prevalence of COPD in adults is estimated at 4-10%[16]. In this study the prevalence of copd was around 11 %.

In a population spirometric screening of 11,027 subjects who were at risk for COPD in 12 Polish cities, airflow limitation was detected in 30.6% of smokers who were 39 years of age who had a smoking history of 10 pack-years.

In our study overall airway limitation was seen in 11.35%.whereas in subjects with age >40 and smoking index >200 obstruction was seen in 23.07 %.

In the study by *Gorecka et al*, obstruction was diagnosed in 41% of patients who were at risk for COPD, most of whom (63%) were in a mild stage of COPD.

Where in our study mild obstruction was seen in 73% subjects which is higher.

In the present study, airflow obstruction was seen in 11.35% of total subjects with 16.5% in above 40 years of age and 6.6% in below 40 years of age. In Lung health study a multi-centric study conducted in Canada and USA, spirometry screening of more than 73,000 smokers aged 35 to 60 years was performed in 10 centres. Airway obstruction was seen in 21.8% to 35.7% (mean 25%) cases and severe obstruction (FEV1 <50% of predicted) was seen in 5% of total cases[17]

11027 subjects were screened with mean age of 51.8 ± 12.5 years and mean smoking history of 26.1 ± 16.8 pack-years (equivalent smoking index 522±336).

Overall obstruction was found in 24.3% cases. Mild obstruction was seen in 9.5%, moderate in 9.6% and severe in 5.2% subjects.

In our study the mean age was 40.13 ±5.47 .The mean smoking index was 300.55 ±219.48 whereas in LHS study symptomatic smokers were also included. A study was conducted by *Geiger RMM et al* to find out the prevalence of undetected persistent airflow obstruction in male smokers 40-65 years old. In this cross-sectional study among 805 male smokers aged 40–65 years spirometry was performed according to ATS recommendations.

In participants with low lung function (FEV1 85% predicted) a bronchodilator test was performed. In 702 participants [mean age 50 years (SD 6.6), mean number of pack years 24.7 (SD 9.6)] with acceptable spirometric curves, previously undetected airflow obstruction was found in 210 subjects (29.9%; 95% CI 26.5–33.4): mild airflow obstruction (GOLD stage 1) in 182 subjects (25.9%; 22.7–29.3) and moderate airflow obstruction (GOLD stage 2) in 28 (4.0%; 2.7–5.7).

Similarly in our study smokers above 40 years and with smoking index above 200 showed obstruction in 23% on spirometry

In subjects with 30 pack years the prevalence of airflow obstruction was 45% versus 20% among those with 20 pack years. In smokers reporting coughing the prevalence was 47% versus 25% in those not reporting this symptom.

Limitations of the study lower incidence of smoking in females in developing countries they were not included. The effect of screening spirometry on persons exposed to indoor/outdoor air pollution (ex: house wives/policemen) in preventing COPD could not be determined, since only smokers were taken in this study.

CONCLUSION

This study shows that early detection yield of COPD increases with increasing age and quantum of smoking making the screening method more cost effective in symptomatic than in asymptomatic smokers. Since early diagnosis provides an excellent opportunity to implement various smoking cessation measures and the earlier the smoker quits the larger the benefits for lung function, by delaying the diagnostic screening one may lose out on the health benefits of smoking cessation. Right now we do not have confirmatory evidence in support of the assertion that early diagnosis of COPD may improve the smoking cessation but in view of not so significant impact of primary prevention of COPD in the form of smoking cessation, the early diagnosis of COPD by spirometry, especially in smokers more than 40 years of age and with smoking index of more than 200, is likely to reduce the overall burden of disease and outweighs the draining of resources used for screening programmes. One way to reduce the cost of such screening programmes is to link spirometry with other screening programmes like detection of diabetes, hypertension and cervical cancer and mammography in women.

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