



International Journal of Allied Medical Sciences and Clinical Research (IJAMSCR)

ISSN:2347-6567

IJAMSCR | Volume 6 | Issue 3 | July - Sep - 2018
www.ijamscr.com

Research article

Medical research

Early detection of chronic obstructive pulmonary disease in asymptomatic smokers using spirometry – a hospital based study

Mohammad Mubarik Naqash¹, Somnath Verma², Tariq Ahmad³, Muzafar naik⁴, Rajesh Minia⁵, Ankush Sharma⁶

¹Professor, Department of Internal Medicine , Sher-I-Kashmir Institute of Medical Sciences (SKIMS), Medical College, Bemina , J&K, India, 190018.

²Postgraduate, Department of Internal Medicine, Sher-I-Kashmir Institute of Medical Sciences (SKIMS), Soura, J&K, India, 190011.

³Associate Professor, Department of Internal Medicine, Sher-I-Kashmir Institute of Medical Sciences (SKIMS), Medical College, Bemina, J&K, India, 190018.

⁴Associate Professor, Department of Internal Medicine, Sher-I-Kashmir Institute of Medical Sciences (SKIMS), Medical College , Bemina ,J&K,India,190018

⁵Postgraduate, Department of internal Medicine Sher-I-Kashmir institute of medical Sciences (SKIMS), Soura, J&K, India, 190011.

⁶Postgraduate, Department of internal Medicine, Sher-I-Kashmir institute of Medical Sciences (SKIMS), Soura, J&K, India, 190011.

***Corresponding Author: Somnath V**

Email id: vermasom743@gmail.com

ABSTRACT

Background

Smokers with suspected COPD seek medical attention when they become dyspnoeic on mild to moderate exertion, but by then half of the ventilatory reserves are lost irreversibly. Hence it seems logical to diagnose COPD early before development of significant symptoms. Since smoking cessation in early COPD is found to reduce rapid decline of ventilatory function in smokers, its early detection in asymptomatic smokers is likely to motivate smokers to make an attempt to quit smoking thereby halting its progression to more advanced stage.

Material and Methods

The study was conducted at Sher-i-Kashmir institute of Medical sciences , Medical college, Bemina ,Srinagar in total number of 350 males subjects . Those are regular smokers, 30 years of age and above with no significant respiratory symptoms except for occasional cough and willing to undergo spirometry. The study was prospective in design. All ethical considerations were taken care of during the study and the recruitment process was started only after ethical clearance from the Institutional Ethical Committee as per norms and all the individuals gave their informed consent to participate in the study. The informed consent taken in local language.

Results

A total of 350 males were evaluated by spirometry. Overall airway obstruction was seen in 43 (12.2%) subjects. Mild obstruction was seen in 42(97.7%) and moderate obstruction in 1 (2.35%) subjects. Among these, 16 (38.9%) were between the age groups of 35-45, 18(42.8%) were in the age group of 45-55, 8(19.04%) were in the age of more than

55 years and moderate obstruction (GOLD Stage 2) was seen in 1 (2.35%) who was in the age group of 35-45. Obstructive pattern was observed in 40 out of 90 subjects, with smoking index >200 and 3 out of 260 subjects with smoking index of ≤ 200 , which was statistically significant (p-value <0.005).

Conclusion

Early detection 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.

Keywords: COPD, Spirometry, Smoking

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a major cause of chronic morbidity and mortality throughout the world. The prevalence and burden of COPD are 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, with more people living longer and thus reaching the age at which COPD normally develops. [1] The global burden of disease study has projected that COPD which ranked sixth as the leading cause of death in 1990, will become the third leading cause of death by 2020. [2, 3] Metaanalysis 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. [4] Worldwide tobacco smoking is the most commonly encountered risk factor for COPD, although in many countries air pollution resulting from the burning of wood and other biomass fuels has also been identified as a COPD risk factor. The early symptoms of COPD in the form of cough and sputum production are usually ignored by the smoker and often by their physicians as normal for a smoker and no interventions are deemed necessary. Individuals seek medical attention when they become dyspnoeic on mild to moderate exertion, but by then half of the ventilatory reserves are lost irreversibly. [5] Hence it seems logical to diagnose COPD early before development of significant symptoms. 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. [8] Although spirometry does not fully capture the impact of COPD on a patient's health, it remains the gold standard for diagnosing and monitoring its progression. [1] It is the best

standardized, most reproducible and most objective measurement of air flow limitation which is the hallmark of COPD. The present study was undertaken for early detection of COPD in high risk population screening by using spirometry.

MATERIAL AND METHODS

The current study was conducted at *Sher-i-Kashmir institute of Medical sciences, Medical college, Srinagar* in total number of 350 males subjects. The study was prospective in design. All ethical considerations were taken care of during the study and the recruitment process was started only after ethical clearance from the Institutional Ethical Committee as per norms and all the individuals gave their informed consent to participate in the study. The informed consent taken in local language. Inclusion criteria included regular male smokers, 30 years of age and above with no significant respiratory symptoms except for occasional cough and willing to undergo spirometry. Subjects with smoking cessation for one year or more before enrolment, with history suggestive of bronchial asthma and on bronchodilators or inhaled corticosteroids were excluded from study. The quantum of smoking exposure was calculated based on smoking index, [9] which was calculated as the product of the average number of cigarettes or bidis smoked per day and the duration of smoking in years. In a country like ours where a pack of cigarette contains either ten or twenty cigarettes and the smoking habits include either cigarette or bidi smoking, smoking index is more appropriate than pack years. In comparative terms, 10 pack years is equivalent to smoking index of 200 (Smoking index=Pack years $\times$ 20).

The spirometer used during the study was Electronic desktop spirometer, Schiller spirowit. The spirometer fulfilled ATS and ERS criteria for

accuracy and precision. Before doing pre-drug spirometry, all the baseline parameters (height, weight, abdominal and hip circumference, pulse) were measured. Before doing spirometry testing, spirometry questionnaire was administered and spirometry was not performed on participants who had any of the contraindications for performing spirometry. The apparatus was calibrated daily and operated within the ambient temperature range of 20-25°C. A maximum forced exhalation was carried out for a minimum of 6 seconds, while the subjects were in a sitting position. Testing was repeated until a minimum of three acceptable flow volume loops with a FEV1 and FVC within 5% were obtained. FVC, FEV1 and FEV1% were measured after administration of 400 µg of salbutamol as per the guidelines given by GOLD.¹ Based on spirometry, subjects were classified as having mild COPD (FEV1/FVC<0.70, FEV1>80% of predicted normal value), moderate COPD (FEV1/ FVC<0.70, FEV1-30-50% of predicted normal value) and very severe COPD

(FEV1/FVC <0.70, FEV1- <30% of predicted normal value) as per GOLD guidelines¹. 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.

RESULTS

The study included a total of 350 male subjects. The age of the subjects ranged from 37 to 70 years with mean age 45.30 ±5.929. There were 179 (51.1%) subjects in the age group of 35-45 years, In the age group of 45-55 years, there were a total of 138 (39.4%) and in the age group of more than 55 years, there were 33 (9.4%) individuals. (Table 1)

Table 1: Demographic characteristics of the studied subjects.

Age (years)	Total(Male)	
	n	%
35-45	179	51.1
45-55	138	39.4
>55	33	9.4
Total	350	100

There were 260 subjects with smoking index ≤200 and 90 subjects with smoking index with >200

Table 2: Showing smoking index of studied subjects.

Smoking index	Total	
	N	%
≤200	260	74.2
>200	90	25.7
Total	350	100

Among 350 subjects which underwent spirometry obstructive pattern in spirometry seen in

43 (12.2%) subjects with average age of 46.65 ± 6.53 (Table 3)

Table 3: showing distribution of obstructive and non-obstructive pattern of spirometry among studied subjects.

Total	Obstructive pattern		Non-obstructive pattern	
	n	%	n	%
350	43	12.2%	307	87.7%

Smoking index was 331.85 ± 78.225 in subjects with obstructive pattern, which was significantly higher than the smoking index of non-obstructive pattern which was 160 ± 56.641 . Obstructive pattern

was observed in 40 out of 90 subjects, with smoking index >200 and 3 out of 260 subjects with smoking index of ≤ 200 , which was statistically significant (p-value <0.005). (Table 4).

Table 4. Showing subjects with obstructive pattern in spirometry as per smoking index (SI).

		spirometry		Total
		Non-obstructive pattern	Obstructive pattern	
smoking index ≤ 200	Count	257	3	260
	% within PFT	83.7%	7.0%	74.3%
>200	Count	50	40	90
	% within PFT	16.3%	93.0%	25.7%
Total	Count	307	43	350
	% within PFT	100.0%	100.0%	100.0%

Chi square: 116.259, P-value <0.005 .

Smoking duration (in years) which was 28.35 ± 7.733 in subjects with obstructive pattern in spirometry was significantly higher than the

subjects with non-obstructive pattern, 24.16 ± 5.980 (p-value <0.005) (Table.5)

Table 5: Showing obstructive pattern in spirometry as per duration of smoking.

	PFT	N	Mean	Std. Deviation	Std. Error	Mean p-value
Duration of smoking(yr) Non-obstructive		307	24.16	5.980	0.341	
obstructive		43	28.35	7.733	1.179	<0.005

Chi square: 16.465, P-value: <0.005

DISCUSSION

We selected subjects 30 years and above, since although most of the smokers start smoking at much early stage, yet the compromise of lung function progresses with age and COPD is more prevalent in more elderly populations [13]. Most of the population based studies have taken subjects above 30-40 years of age for screening early COPD. In DIDASCO Study (Differential Diagnosis between Asthma and COPD), a population based study, individuals aged 35 to 70 years were subjected to spirometry for early detection of airflow limitation [14]. Most of Indian studies have screened population for COPD above 30 years of age [15, 16]. Previous studies have used two methods for early detection of COPD: high risk population screening [17, 12, 18, 19] and case finding [14, 10]. Both methods have their advantages and disadvantages making them complimentary. We chose the high risk population screening method because of better infrastructure and resources. In our study age of subjects were

between 37-70yr with mean age 45.30 ± 5.929 years.

In our study, total airflow obstruction was seen in 12.2% of total subjects. Mild obstruction (GOLD Stage 1) was seen in 42 (97.7%) and moderate obstruction (GOLD Stage 2) was seen in 1 (2.35%). MS Barthwal and S Singh [11], conducted study on early detection of COPD in asymptomatic smokers using spirometry. In this study overall airway obstruction was seen in 58 (12.60%) subjects. Mild obstruction was seen in 40 (68.9%) and moderate obstruction in 18 (31%) subjects. The results of this study are concordance with our study. In Lung health study (LHS)[20], 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 centers. Airway obstruction was seen in 21.8% to 35.7% (mean 25%) cases and severe obstruction ($FEV_1 < 50\%$ of predicted) was seen in 5% of total cases. The lower prevalence of airflow obstruction in our study was because of inclusion of only asymptomatic smokers whereas in LHS study symptomatic smokers were also included and the population group in LHS

study was quite large as compared to our study group.

In our study obstructive pattern was observed in 40 out of 90 subjects with smoking index >200 and 3 out of 260 subjects with smoking index of ≤ 200 ($p < 0.005$) which was statistically significant. MS Barthwal and S Singh [11] in this study obstruction was noticed in 42 (24.70%) out of 170 subject with smoking index >200 and 16 (5.51%) out of 290 subjects with smoking index of <200 ($p < 0.005$). The reason for more percentage in group with smoking index more than equal to 200 in our study is because duration of smoking in our subjects were very high. Smoking duration (in years) which was 28.35 ± 7.733 in subjects with obstructive pattern was significantly higher than the subjects with non-obstructive, 24.16 ± 5.980 ($p\text{-value} < 0.005$). Stralelis G, et al [12] in a study to evaluate a method to detect COPD at an early stage conducted spirometry in 512 smokers, aged 40-55 years with pack-years more than 30 yrs (equivalent to smoking index of 600) and found obstruction in 27% cases. Similarly in our study we found Obstructive pattern in 40 out of 90 subject with smoking index >200 and 3 out of 260 subjects with smoking index of ≤ 200 , which was statistically significant ($p\text{-value} < 0.005$).

Zielinski et al [17] of "Know the age of your lung study group" evaluated the efficacy of mass spirometry in detection of airflow obstruction in high risk population above 39 years of age. 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. The difference from our study is again explained by high mean age, high smoking index and large study group in this

study. Analysis of sub-groups in the study showed that obstruction seen in 30.6% of smokers above 40 years of age with smoking history of more than 10 pack years (equivalent to smoking index >200) as compared to 8.3% of smokers below 40 years of age and having smoking history of less than 10 pack years (equivalent to smoking index <200). The same correlation was observed in our study, i.e. airway obstruction were seen in 40 out of 90 subject with smoking index >200 and 3 out of 260 subjects with smoking index of ≤ 200 ($p < 0.005$).

CONCLUSION

The present 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. At present 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.

REFERENCES

- [1]. Global Initiative for Chronic Obstructive Lung Disease (COPD). Global strategy for the diagnosis, management and prevention of COPD: NHLBI/WHO Workshop Report. Bethesda: National Heart, Lung and Blood Institute; Publication No. 2006, 02-3659. Updated.
- [2]. Lopez AD, Shibuya K, Rao C, Mathers CD, Hansell AL, Held LS, et al. Chronic obstructive lung disease: current burden and future projections. *Eur Respir J* 27, 2006, 397-412
- [3]. Murray CJ, Lopez AD. Alternative projections of mortality and disability by cause 1990-2020: Global Burden of Disease Study. *Lancet* 349, 1997, 1498-504.
- [4]. Jindal SK, Aggarwal AN. A review of population studies from India to estimate national burden of Chronic obstructive lung disease and its association with smoking. *Indian J Chest Dis Allied Sci* 43, 2001, 139-147.

- [5]. Mannino DM, Gagnon RC, Petty TL. Obstructive lung disease and low lung function in adults in the United States: data from National Health and Nutrition Examination Survey. 1988-1994. *Arch Intern Med* 160, 2000, 1683-89.
- [6]. Fletcher C, Peto R. The natural history of chronic airflow obstruction. *Br Med J* 1, 1977, 1645-48.
- [7]. Anthonisen NR, Connet JE, Kiley JP, et al. Effects of smoking intervention and the use of an inhaled anticholinergic bronchodilator on the rate of decline of FEV1: the lung health study. *JAMA* 272, 1994, 1497-1505.
- [8]. Gorecka MD, Bednarek M, Nowinski A, et al. Diagnosis of airflow limitation combined with smoking cessation advice increases stop smoking rate. *Chest* 123, 2003, 1916-1923.
- [9]. Jindal SK, Malik SK, Dhand R. Bronchogenic carcinoma in northern India. *Thorax* 37, 1983, 343-47.
- [10]. Van Schayck CP, Loozen JM, Wagena et al. Detecting patients at high risk of developing chronic obstructive pulmonary disease in general practice; cross-sectional case-finding study. *BMJ* 324, 2002, 1370-4.
- [11]. MS Barthwal, S Singh, Early Detection of Chronic Obstructive Pulmonary Disease in Asymptomatic Smokers using Spirometry, *Journal of the Association of Physicians of India* 2014 : 62 : 238-242.
- [12]. Georgios Stratelis et al, Early detection of COPD in primary care: screening by invitation of smokers aged 40 to 55 years. *British Journal of General Practice*, 2004, 54, 201-206.
- [13]. Shapiro DS, Snider GL, Rennard SI. In: Mason RJ, Murray JF, Broaddus VC, Nadel JA, editors. *Textbook of Respiratory Medicine*. Philadelphia: Elsevier Saunders 2000, 1115-1167.
- [14]. Buffels J, Degryse J, Heyrman J, Decramer M. Office spirometry significantly improves early detection of COPD in general practice. *Chest* 125, 2004, 1394-1399.
- [15]. Pande JN, Khilnani GC. Epidemiology and aetiology, In: Shankar PS, ed. *Chronic Obstructive Pulmonary Disease: Indian College of Physicians* 1997, 10-22.
- [16]. Jindal S K, Aggarwal A N, Chaudhry K, Chhabra S K, et al. A multicentric study on epidemiology of chronic obstructive pulmonary disease and its relationship with tobacco smoking and environmental tobacco smoke exposure. *Ind J Chest Dis and Allied Sci* 48, 2006, 23-29.
- [17]. Zielinski J, Bednarek M. Early detection of COPD in a high-risk population using spirometric screening. *Chest* 119, 2001, 731-736.
- [18]. Geijer RMM, Sachs APE, Hoes AW, Salome PL, Lammers J-WJ, Verheij TJ. Prevalence of undetected persistent airflow obstruction in male smokers 40-65 years old. *Family Practice* 22, 2005, 485-9.
- [19]. Lundback B, Lindberg A, Lindstorm M, Jonsson AC, Jonsson E, et al. Not 15 but 50% of smokers develop COPD?—report from the obstructive lung disease in Northern Sweden studies. *Respir Med* 97, 2003, 115-22.
- [20]. Connett JF, Bjornson-Benson WM, Daniels K. Recruitment of participants in the Lung Health Study: 11. Assessment of recruiting strategies: Lung Health Study Research Group. *Control Clin Trials* 14, 1993, 38S-51S.

How to cite this article: Mohammad Mubarik Naqash, Somnath Verma, Tariq Ahmad, Muzafar Naik, Rajesh Minia, Ankush Sharma. Early detection of chronic obstructive pulmonary disease in asymptomatic smokers using spirometry – a hospital based study. *Int J of Allied Med Sci and Clin Res* 2018; 6(3): 518-523.