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Spirometry Screening for Respiratory Obstruction in Asymptomatic Elderly

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Abstract

Background: Elderly people are especially prone to the adverse health effects of chronic obstructive pulmonary disease (COPD), which is a common disorder in that population. Although the prevalence and morbidity of COPD in the elderly are high, it is often undiagnosed.

Aim: To evaluate the prevalence of airway obstruction among asymptomatic elderly.

Methods: A cross sectional study was carried over a period of one year where 100 elderly patients aged 60 years and older were recruited from the outpatiens geriaric clinic in Ain Shams University Hospital. Each patient underwent detailed history taking including smoking history and medication review, detailed general medical examination and cognitive assessment by Mini - mental status examination test. Elderly with a physician diagnosis of asthma, COPD or another chronic respiratory condition were excluded. All subjects completed spirometry testing to diagnose airway obstruction..

Results: The sample included 100 participants with a mean age of 64.3±3.1years, 52% male and 48% female, mean body mass index was 29.3 ±1.5 and mean mini mental state examination 24.45± 2.3. As regard smoking 61% never smoked. 9% ex-smoker and 30% current smoker. Spirometery in the current study demonstrated that 72% had obstructed airway disease (none of them were diagnosed previously to have chronic bronchitis) classified to mild, moderate and severe (35%, 33%, 4%) respectively.

Conclusions: Spirometry screening of asymptomatic elderly may help detection of individuals with airway obstruction, who are at high risk of developing COPD. Additional data is necessary regarding the clinical benefit and cost-effective of screening before spirometry can be recommended in general practice.

Keywords: Spirometry , COPD, air way obstruction in elderly.

Background:

Chronic obstructive pulmonary disease (COPD) is a respiratory disorder characterized by longstanding airflow obstruction caused by emphysema or chronic bronchitis. [1]
COPD is responsible for significant morbidity, early mortality, high death rates and substantial costs to the healthcare system. COPD is projected to be the third most frequent cause of death worldwide by 2020 and the fifth leading cause of years lost through early disability. [2]
Elderly people are especially prone to the adverse health effects of chronic obstructive pulmonary disease (COPD), which is a common disorder in that population. Although the prevalence and morbidity of COPD in the elderly are high, it is often undiagnosed. [3]
In its early stages COPD is sometimes missed, as COPD patients learn to limit their physical activities to escape the gradually emerging dyspnea on exertion. So

they may be asymptomatic in the early stages of the disease. Early diagnosis of the disease, elimination of the etiologic factors, and effective symptomatic treatment are important for improving the quality of life in COPD patients. One study found undiagnosed airflow obstruction to be more common than physician diagnosed COPD and asthma combined. [4]

Spirometry facilitates the measurement of airflow and lung volumes. It allows for volume assessment measured at the mouth and, together with lung volume measurement, gives a comprehensive evaluation of all lung compartments. It is an uncomplicated investigation and the equipment required is affordable and usually available in a chest unit and in many community-based primary and secondary care clinics. However, it is a volitional test of flow and volumes, and thus is directly dependent on the motivation of the patient and the experience of the staff. [5]

Methods

Over a period of 1 year from December 2014 to November 2015, a total of 100 elderly patients aged 60 years and older were recruited from the outpatient geriatric clinic in Ain Shams University Hospital. Each patient underwent detailed history taking including smoking history and medication review, detailed general medical examination and cognitive assessment by Mini - mental status examination test (MMSE). [6] Elderly with cognitive impairement were excluded from the study. Elderly subjects with a physician diagnosis of asthma, COPD or another chronic respiratory condition were excluded.

Spirometry was performed by trained respiratory technicians using a spirometer (Flow screen spirometry, VIASYS, Model 2007) and following standard procedures. [7,8] Prior to spirometry, participants underwent weight and height measurements. The best forced expiratory volume in one second (FEV1) and forced vital capacity (FVC) were recorded and the FEV1/FVC ratio was calculated. Spirometric results were interpreted according to the Global Initiative for Chronic Obstructive Lung Disease criteria.[9]

FEV1/FVC ratio of less than 70% and a post-bronchodilator increase in FEV1 of less than 12% and 200 ml from the pre bronchodilator value indicates COPD. FEV1% predicted above 80% was used to diagnose mild disease, FEV1% predicted between 50% - 80% was used to diagnose moderate disease, severe disease was diagnosed when FEV1% predicted was less than 50% and very sever disease was diagnosed when FEV1% predicted was less than 30%. [9]

Ethical consideration

Informed oral consent was taken from the patient or care giver after explanation of the study aim and procedure and the study methodology was reviewed and approved by the Research Review Board of the Geriatrics and Gerontology Department, Faculty of medicine, Ain Shams University.

Statistical Analysis

The collected data were coded, tabulated, and statistically analyzed using SPSS version 22.0 (SPSS, Chicago, IL,USA). Quantitative variables were presented in the form of means and standard deviations. Qualitative variables were presented in the form of frequency tables (number and percent).

Results

A total of 100 elderly patients were recruited with mean age of 64.3±3.1years, 52% male and 48% female, their body mass index was between 23.5 to 36.1 (29.3 ±1.5) with mini mental state examination between 22 to 26 (24.45± 2.3) and as regard smoking 61% never smoked, 9% ex-smoker and 30% current smoker. [Table (1)]

The most prevelant comorbid diseases were hypertension 45%, diabetes 19%, heart failure 15% and ischemic heart disease 5% . As regard medications affecting pulmonary function, 30% of them were on regular use of angiotensin-converting-enzyme inhibitor and 21% on B-blockers [Table (2)].

The spirometery measurement of the studied participants demonstrated that 28% are non-obstructed and 72% have obstructed airway disease (none of them were diagnosed to have chronic bronchitis) classified to mild, moderate and severe (35%, 33%, 4%) respectively [Table (3)].

Comparison between participants with obstructive and non obstructives spirometery results regards demographic data and comorbid diseases showed statistically significant difference regarding age and BMI [Table (4)].

Table 1: **Demography of the study population**

		N.	Percent (%)
Sex	Male	52	52.0
	Female	48	48.0
Age	Mean ± SD	64.3±3.1	
Smoking	Never	61	61.0
	Ex-smoker	9	9.0
	Current	30	30.0
BMI (Kg/m²)	Mean ± SD	29.3±1.5	

Table (2): Comorbidities, medications used among the studied cases

Comorbidities	%
Hypertension	45.0
Diabetes	19.0
Heart failure	15.0
ISHD	5.0
Medications used	
ACEI	30.0
β-Blockers	21.0

Table (3): Respiratory measurements of the studied cases

FEV1 percentile	(Mean±SD)	85.4±21.7
FEV1/FVC	Normal >0.7	28.0%
	COPD <0.7	72.0%
FEV1 grades	Mild >80	35.0%
	Moderate 50-79%	33.0%
	Severe 30-49%	4.0%

Table (4): Comparison between obstructive and non-obstructive groups

Variable		Obstructive (N=72)	No obstruction (N=28)	P
Age (years)		63.8±3.4	64.8±4.8	^*0.045
BMI (Kg/m2)		28.8±6.2	30.5±8.9	^*0.006
Sex	Male	38 (52.8%)	14 (50.0%)	#0.803
	Female	34 (47.2%)	14 (50.0%)	
Current smoking		24 (33.3%)	6 (21.4%)	#0.243
ACEI		22 (30.6%)	8 (28.6%)	#0.846
β-Blockers		17 (23.6%)	4 (14.3%)	#0.304
HTN		35 (48.6%)	10 (35.7%)	#0.244
DM		14 (19.4%)	5 (17.9%)	#0.856
HF		11 (15.3%)	4 (14.3%)	#0.901
ISHD		3 (4.2%)	2 (7.1%)	#0.540

Discussion

The world's population is not only growing larger, it is also becoming older. The proportion of older persons is increasing at a faster rate than any other age segments.[10]

Many diseases are important comorbidities having a higher frequency among elderly than in the general population and having more severe consequences, including impact on mortality, morbidity and HR-QOL (health-related quality of life). [11]

Chronic obstructive pulmonary disease (COPD) is a highly prevalent disease that has a large impact on quality of life for patients and their families and kills millions of people worldwide. [12] Undiagnosed respiratory diseases and the underutilization of PFT in elderly patients are common and the impact of undiagnosed disease is substantial. [13]

In the current study we evaluated the prevalence of airway obstruction diagnosed by spirometry among asymptomatic elderly. A total of 100 elderly patients were recruited from the outpatient geriatric clinic in Ain Shams University Hospital.. the mean age was 64.3±3.1years, 52% male and 48% female, as regard smoking 61% never smoked, 9% ex-smoker and 30% current smoker. As regard comorbidity there was 45% hypertensive, 19% diabetic, 15% heart failure and 5% ischemic heart disease.

Spirometery in the current study demonstrated that 28% are non-obstructed and 72% have obstructed airway disease (none of them were diagnosed to have chronic bronchitis) classified to mild, moderate and severe (35%, 33%, 4%) respectively. This agrees with Bertens et al. [14] who established that with an active search for COPD in community-dwelling elderly subjects; substantially more new patients with COPD can be detected.

Another Indian study done by Vinay et al. 2015 [15] including 1000 inpatients and outpatients elderly for screening of COPD found that newly diagnosed COPD was detected is 22.8% of the patients and the cause of this controversy with our current study is rooted in the fact of large number of their study in addition to that, Vinay and his colleagues studied inpatient and outpatients

The current study found that 33% of asymptomatic smoker had air way obstruction and this agree with A prospective survey and spirometry testing of participants aged 35–70 years (30% smokers) visiting their primary care physician found evidence of obstructive airway disease in 18% of participants with respiratory complaints, compared with only 4% among those without symptoms.[16]

Wisnivesky et al. 2004 [17] evaluated the results of spirometry screening on a large cohort of asymptomatic

smokers undergoing a health maintenance examination; they found that the prevalence of undiagnosed airway obstruction in this population was 2.3%.

The higher prevalemce among the current studied population can be explained with population variation with the high prevalence of pollution in our country. Participants were trained on using the spirometry but still elderly people can find difficulty in dealing with the spirometry so larger studies are needed to confirm such prevalence.

Classical screening criteria suggest, among other things, that there should be an accepted treatment for the condition being diagnosed early and that the cost of case finding and treatment should be economically balanced with other medical expenditures. [18]

The potential benefits of spirometry screening of high-risk individuals are primarily related to the possibility of initiating smoking cessation interventions. Cigarette smoking is the most important risk factor for the development and progression of COPD and smoking cessation is the most effective intervention to slow down loss of lung function. [19]

COPD is characterised by airway and systemic inflammation; inhaled corticosteroids may be useful in reducing this inflammation. [20] Treatment of asymptomatic smokers with airway obstruction with anti-inflammatory drugs might be another intervention that, in addition to smoking cessation, could slow down the progression of disease.[21]

The impact of inhaled corticosteroids treatment on disease progression, as measured by the annual rate of FEV1 decline, has been evaluated in several randomised trials and meta-analyses [22]showed that inhaled corticosteroids slowed the decline in lung function in 6112 patients with moderate-to-severe COPD.[23]

However, other studies and a different meta-analysis found no beneficial effect of inhaled corticosteroids on lung function. [24] Additionally, trials evaluating the role of inhaled corticosteroids have not been performed in asymptomatic patients with mild COPD or airflow limitation. Consequently, clear evidence that early detection and subsequent treatment with inhaled corticosteroids leads to clinical benefits in patients diagnosed with COPD is still lacking. Moreover, the cost-effectiveness of a COPD screening program has not been evaluated.

Conclusions:

Spirometry screening of asymptomatic elderly may help detection of individuals with airway obstruction who are at high risk of developing COPD. Additional data is necessary regarding the clinical benefit and cost-effective of screening before spirometry can be recommended in general practice

References

1- Snider GL. Nosology for our day: its application to chronic obstructive pulmonary disease. Am J Respir Crit Care Med. 2003; 167: 678-83.

2- Halpin DM, Miravitlles M. Chronic obstructive pulmonary disease: the disease and its burden to society. Proc Am Thorac Soc2.2006; 3:619-23.

3- Medbo A, Melbye H. Lung function testing in the elderly—can we still use FEV1/FVC< 70% as a criterion of COPD?. Respir Med. 2007;101: 1097-1105.

4- Meral M, Araz Ö, Yılmazel Uçar E, Yılmaz N and Mirici NA .Nutritional assessment via anthropometric and biochemical measurements with stable COPD. Turk J Med Sci 2012; 42: 1490–3.

5- Shiner R and Steier J .Lung made easy, Introduction of 13th edition 2013: p. 37.

6- Folstein MF, Folstein SE and McHugh PR. Mini-mental state. A practical method for grading the cognitive state of patients for the clinician. Journal of Psychiatric Research1975; 12(3): 189-98.

7- Standardization of Spirometry. Update. American Thoracic Society. Am J Respir Crit Care Med 1995; 152: 1107-36.

8- Enright PL, Johnson LR, Connett JE, Voelker H, Buist AS. Spirometry in the Lung Health Study. 1.Methods and quality control. Am Rev Respir Dis 1991;143:1215-23.

9- GOLD – Global Initiative for Chronic Obstructive Lung Disease (2013): Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease. National Institutes of Health National Heart, Lung, band BloodInstitute.Availablefrom:http://www.goldcopd.org/uploads/users/ files/GOLD_Report 2013. Accessed 22 Feb 2013

10- United Nations Fund for Population Activities, UNFPA (2012): Available at http://egypt.unfpa.org/ english / Staticpage/e82b3581-f41b-4e13-889ac 5b22aecac85/ Population_Ageing.aspx.

11- Carlos HM, David MM, Miguel JD. Defining COPD-Related Comorbidities, J COPD F. 2014; 1(1): 51-63.doi: 1.2014.0119.

12- Global Initiative for Chronic Obstructive Pulmonary Disease (2006): Global strategy for the diagnosis, management, and prevention of Chronic Obstructive Pulmonary Disease. National Institutes of Health, National Heart, Lung and Blood Institute and World Health Organization

13- Apostolovic S, Jankovic-Tomasevic R, Salinger-Martinovic S, Djordjevic - Radojkovic D, Stanojevic D, Pavlovic M, et al. Frequency and significance of unrecognized chronic obstructive pulmonary disease in elderly patients with stable heart failure. Aging Clin Exp Res 2011; 23(5-6):337-342.

14-Bertens L, Reitsma L, Mourik Y, Lammers J, Moons K, Hoes A, et al. COPD detected with screening: impact on patient management and prognosis, Eur. Respir. J.2014; 44: 1571-1578.

15- Vinay M, Arati M, Naveen A, Vijayanand M, Ajith E, Mitchelle L, Sujeer K. Screening for chronic obstructive pulmonary disease in elderly subjects with dyspnoea and/or reduced exercise tolerance – A hospital based cross sectional study.2015

16-Enright PL, Johnson LR, Connett JE, Voelker H, Buist AS. Spirometry in the Lung Health Study. 1. Methods and quality control. Am Rev Respir Dis 1991;143:1215–23.

17- Wisnivesky J, Skloot G, Rundle A, Revenson T, Neugut A. Spirometry screening for airway obstruction in asymptomatic smokers; AUSTRALIAN FAMILY PHYSICIAN 2014: 43;463-467

18-Buffels J, Degryse J, Heyrman J, Decramer M. Office spirometry significantly improves early detection of COPD in general practice: the DIDASCO Study. Chest 2004;125:1394–99.

19- Xu X, Dockery DW, Ware JH, Speizer FE, Ferris BG, Jr. Effects of cigarette smoking on rate of loss of pulmonary function in adults: a longitudinal assessment. Am Rev Respir Dis 1992;146:1345–48.

20- Sin DD, Paul Man SF. Cooling the fire within: inhaled corticosteroids and cardiovascular mortality in COPD Chest. 2006;130:629–31.

21-Dompeling E, van Schayck CP, van Grunsven PM, et al. Slowing the deterioration of asthma and chronic obstructive pulmonary disease observed during bronchodilator therapy by adding inhaled

corticosteroids. A 4-year prospective study. Ann Intern Med 1993;118:770–78.

22. Vestbo J, Sorensen T, Lange P, Brix A, Torre P, Viskum K. Long-term effect of inhaled budesonide in mild and moderate chronic obstructive pulmonary disease: a randomised controlled trial. Lancet 1999;353:1819–23.

23-Celli BR, Thomas NE, Anderson JA, et al. Effect of pharmacotherapy on rate of decline of lung function in chronic obstructive pulmonary disease: results from the TORCH study. Am J Respir Crit Care Med 2008;178:332–38.

24-Highland KB, Strange C, Heffner JE. Long-term effects of inhaled corticosteroids on FEV1 in patients with chronic obstructive pulmonary disease. A metaanalysis. Ann Intern Med 2003;138:969–73.

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