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ORIGINAL ARTICLE

Prevalence and severity of airway obstruction in an Italian adult population

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ABSTRACT: ***Prevalence and severity of airway obstruction in an Italian adult population. G. Riccioni, M. De Benedictis, R. Della Vecchia, C. Di Ilio, M.T. Guagnano, N. D'Orazio.***

Background. **This study sets out to estimate the prevalence and the degree of severity of bronchial obstruction in an adult population with three different diagnostic criteria: the European Respiratory Society (ERS), the American Thoracic Society (ATS), and the World Health Organization (WHO) defined as Global Obstructive Lung Disease (GOLD).**

Methods. **1514 subjects underwent complete medical evaluation and spirometry.**

Results. **The prevalence of bronchial obstruction was respectively 27.5% (ERS), 33% (GOLD), and 47.3% (ATS). The prevalence of bronchial obstruction in the smoker group was 33.4% (ERS), 38.1% (GOLD), and 52.3% (ATS). The prevalence of obstruction in the ex-smoker group was 33% (ERS), 41.4% (GOLD), and 57.1% (ATS). The prevalence of obstruction in the non-smoker group was 21.1% (ERS), 24.9% (GOLD), and 38.6% (ATS).**

Conclusions. **The results show that the prevalence of airway obstruction increases proportionally with age; the cigarette smoking represents an important conditioning factor. These observations warrant the necessity of a more complete and multi-parametric analysis in the evaluation of patients with airway obstruction using methodologies that explore the functional state and the risk factors that cause the airway obstruction.**

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Keywords: COPD, prevalence, guidelines, airway obstruction, GOLD, ATS, ERS.

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Introduction

Chronic Obstructive Pulmonary Disease (COPD) currently represents an important public health problem in developing countries, considering the strong socio-economic impact and the remarkable treatment costs. On a world-wide level COPD is the fifth leading cause of death and the twelfth in morbidity [1]. The World Health Organization (WHO) projections for 2020 sees an ulterior rise reaching third place for mortality, and sixth place for morbidity and disability [2, 3]. In industrialized countries this phenomenon depending on the aging of the population and the failure of anti-cigarette smoking campaigns, cigarette smoking being the major factor in the onset and progression of COPD [4, 5].

In 1995 the European Respiratory Society (ERS) [4] and then the American Thoracic Society (ATS) [6] published conclusions to standardise diagnostic and therapeutic approaches for COPD.

The ERS classification is based only on the measurement of the forced expiratory volume in the first second (FEV_1) in percentage of the predicted value for sex and age. Because the FEV_1 has demonstrated to have the best correlation with morbidity and mortality in COPD, the ATS classification is also based on the obstruction degree. The majority of patients with COPD are included in the first stage of the ATS classification, and consequently they require minor medical resources. At this stage, in fact, patients with $FEV_1 \geq 50\%$ of the predicted value are included, without bronchial obstruction, which comprises various stages of the ERS classification, from mild to moderate-severe degrees [6].

Among the various international guidelines some have considered only the severity, as monitored by FEV_1 (ATS and ERS), while others have considered the symptoms present in several stages of the disease. A similar classification has been included in the recent Global Strategy for Diagnosis and the Treatment of COPD [7], with the acronym GOLD (Global Strategy for the Diagnosis, Management, and Prevention of COPD), elaborated from the National Institute of Health (NIH) in col-

laboration with the WHO [8]. The primary end point of the study is to estimate the prevalence and the degree of severity of bronchial obstruction in an adult Italian population of 1,514 subjects with three diagnostic criteria: ERS, ATS and GOLD, and the relationship between bronchial obstruction, age, and cigarette smoke.

Methods

Patients Selection

From January to December 2002, 1514 consecutively subjects (969 males and 545 females), with age ≥ 25 years were enrolled at the Pathophysiology Respiratory Center of the Department of Internal Medicine and Aging of the Hospital "SS. Annunziata" in Chieti. All subjects underwent a complete medical examination, spirometry and bronchial reversibility test with salbutamol, and history for the presence of the symptoms (chronic cough and/or dyspnoea, morning sputum production), the exposure to risk factors, the familiarity for COPD, the smoking habit and the skin prick tests. "Smokers" were those who smoked at least 20 cigarettes pack/years; former smokers those who had stopped smoking at least 6 months ago, and non- smokers were those who had never smoked before. Exclusion criteria from the study were: age < 25 years, bronchial asthma, bronchiectasies, interstitial lung disease, acute sinusitis, pregnancy, gastro-oesophageal reflux, positive reversibility bronchial test and insufficient compliance to the execution of the tests. Informed consent was obtained from each patient and the study was approved by the Ethical Committee of our University.

Functional Respiratory Testing

Every subject underwent at least 3 spirometric tests (Spirometer PFT2, COSMED, Latina, Italy) to reach the Standards of the ATS [6]. For each subjects we have measured FEV1, Peak Expiratory Flow (PEF), Forced Vital Capacity (FVC). The reversibility test was considered positive if the improvement of FEV1 after the administration of salbutamol (200 μg) was ≥ 15% respect to prebronchodilator value. The bronchial obstruction diagnosis was made following the criteria adopted by the three international guidelines: ERS, ATS, and GOLD. Skin prick tests (Lofarma, Milan, Italy) were performed on the volar side of the forearm according to the Subcommitte on skin tests of the European Academy of Allergy and Clinical Immunology (EAACI).

Statistical Analysis

Data is expressed as percent mean values of the predicted value (ATS and GOLD criteria), and percent of the theoretic value (ERS criteria) ± standard deviation (SD).

Results

Personal data and spirometric values of the study population

Personal data and spirometric details of the study population (number of subjects, sex, age, and values of pulmonary functionality tests) are summarised in table 1.

1514 subjects were enrolled in the study, 969 males (mean age 45.72 ± 18.97 years) and 545 females (mean age 43.49 ± 18.54 years); 432 subjects with age between 25-45 years, and 1082 subjects with age ≥ 45 years. Spirometric values of FEV_1 and FEV_1/FVC (in percentage of the theoric and the predicted value) were respectively 86±25 % (predicted), 94±14 % (theoric), and 73±11 % (predicted).

Table 1. - Airway obstruction degrees.

Degree obstruction	**Guidelines** (No of subjects/percentage value)		
	ERS	**GOLD**	**ATS**
Normal *(without obstruction)*	**1097 (72.45%)**	**827 (54.6%)**	**798 (52.7%)**
At risk	–	188 (12.4%)	–
Mild	148 (9.8%)	101 (6.7%)	388 (25.6%)
Moderate	139 (9.2%)	383 (25.3%)	92 (6.1%)
Moderate - Severe	–	–	98 (6.5%)
Severe	129 (8.5%)	15 (1.0%)	106 (7.0%)
Very severe	–	–	32 (2.1%)
Total *(with obstruction)*	**417 (27.5%)**	**499 (33%)**	**718 (47.3%)**

Prevalence of the obstruction

The prevalence of subjects without bronchial obstruction was 72.45% with the ERS criteria, respect to 54.6% (GOLD criteria) and 52.7% (ATS criteria). The prevalence of bronchial obstruction was 27.55% with the ERS criteria, 33% with the GOLD criteria, and 47.3% with the ATS criteria.

The prevalence of mild obstruction was 9.8% with the ERS criteria, 6.7% with the GOLD criteria and 25.6% for the ATS criteria. The prevalence of moderate obstruction was 9.2% with the ERS criteria, 25.3% with the GOLD criteria and 6.1% with the ATS criteria. The prevalence of severe obstruction was 8.5% with the ERS criteria, 1.0% with the GOLD criteria, and 7.0% with the ATS criteria (table 1 and figure 1).

Airway obstruction and age

The prevalence of mild obstruction in the 432 subjects aged between 25-45 years was 9% with the ERS criteria, 3.5% with the GOLD criteria, and 17.6% with the ATS criteria. The prevalence of the moderate obstruction was 2.8% with the ERS criteria respect 5.3% with the GOLD criteria and 1.4 % with the ATS criteria. The prevalence of severe obstruction was 0.7% with the ATS criteria, 0.2% with the GOLD criteria and 0.5 % with the ATS criteria.

In the 1082 subjects aged ≥ 45 years the prevalence of mild obstruction was 10.2% with the ERS criteria, respect to 8% with the GOLD criteria and 28.8% with the ATS criteria. The prevalence of moderate obstruction was 11.7% with the ERS criteria, 33.3% with the GOLD criteria, and 8.0% with the ATS criteria. The prevalence of severe obstruction was 11.6% with the ERS criteria, 1.2% with the GOLD criteria, and 9.6% with the ATS criteria (table 2).

Obstruction and cigarette smoke

302 subjects were smokers, 497 ex-smokers, and 715 non smokers. The prevalence of bronchial obstruction in the smokers group (302 subjects) was 33.4% with the ERS criteria, 38.1% with the GOLD criteria, and 52.3% with the ATS criteria. The prevalence of obstruction in the ex-smokers group (497 subjects) was 33% with the ERS criteria, 41.4% with the GOLD criteria, and 57.1% with the ATS criteria. The prevalence of obstruction in non-smoker group was 21.1% with the ERS criteria, 24.9% with the GOLD criteria, and 38.6% with the ATS criteria (figure 2).

Discussion

The study showed the prevalence of airways obstruction in an adult Italian population with three international criteria: the ERS, the ATS and the recent guidelines of WHO/NIH defined GOLD.

The prevalence of obstruction in a general population depends to the criteria adopted for the diagnosis. In particular the ATS criteria demonstrated a greater estimation of bronchial obstruction respect to other two guidelines. This fact is important because in these chronic diseases it is necessary to begin pharmacological treatment in the early phase to prevent complications and educate the patient towards successful treatment of the disease [9]. The over-estimation of the prevalence of bronchial obstruction, evaluated with the ATS criteria, respect to the ERS and GOLD guidelines is greater especially in the mild stages, and in particular, in subjects aged ≥ 45 years, this trend is stable even in smokers and ex-smokers. In opposition to the ATS, the GOLD guidelines characterise groups of subjects defined as "at risk" from airway obstruction through the evaluation of both the symptoms and airway obstruction. Summarising the subjects at risk with those affected by airway obstruction, the percentage of subjects with airway obstruction increases until they arrive at equal percentage values of the ATS guidelines. The ERS guidelines underestimate the obstruction with respect to the other two guidelines. In fact, with this criteria there is an high percentage of subjects without airway obstruction (72.5%), and a low percentage of subjects with mild obstruction (9.8%), compared to 25.6% with the ATS criteria, and 19.1% with the GOLD criteria (subjects at risk and with mild obstruction).

The results of the study highlight an evident rate of obstruction prevalence that stretches to increase proportionally with age; in fact, this increment is present in the older subjects. This data is confirmed in numerous epidemiological study, which have involved all age groups [10].

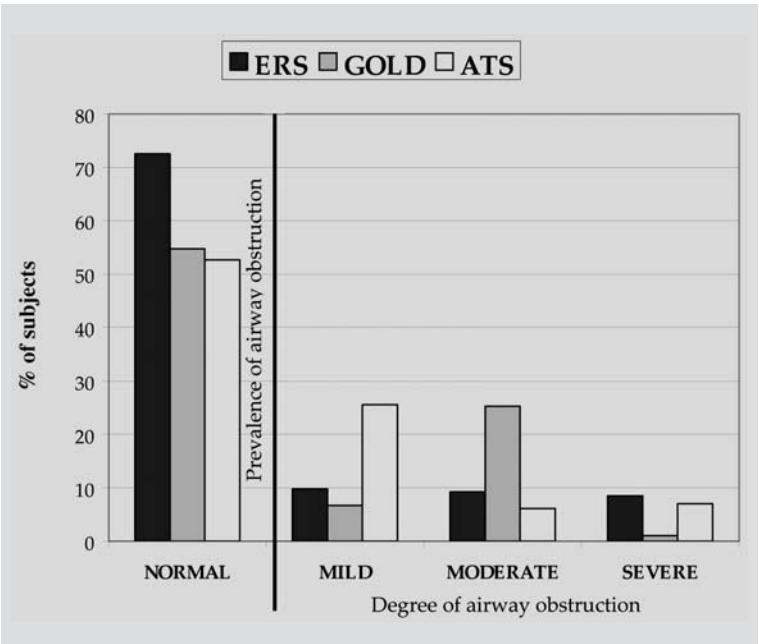

Fig. 1. - Degree and prevalence of airway obstruction in the study population.

Table 2. - Degree of airway obstruction and age

Degree of obstruction	Guidelines No of subjects (percentage value)*		
	ERS	**GOLD**	**ATS**
		25 - 45 years (No 432)	
Mild	39 (9.0%)	15 (3.5%)	76 (17.6%)
Moderate	12 (2.8%)	23 (5.3%)	6 (1.4%)
Severe	3 (0.7%)	1 (0.2%)	2 (0.5%)
		>45 years (No 1082)	
Mild	110 (10.2%)	87 (8%)	317 (28.8%)
Moderate	127 (11.7%)	360 (33.3%)	87 (8.0%)
Severe	126 (11.6%)	13 (1.2%)	104 (9.6%)
TOTAL	**417 (27.5%)**	**499 (33%)**	**718 (47.3%)**

* of age-related sub-groups or of total population.

Another important result of this study is represented by the cigarette smoking. There is an important conditioning factor which increasing the prevalence of obstruction in smokers and ex-smokers, respect to no-smokers [11]. Such data seems apparent considering smoking is an aggravating cause of the bronchial obstruction [12-14].

It is relevant here to draw attention to health-related costs as it is necessary to establish the relationship between the benefit and such costs in many chronic diseases such COPD [15]. The fundamental concept is a preliminary corrected approach to the severity of the disease on the basis of the symptoms, the airflow limitation, the frequency, and severity of the exacerbations. These observations testify the necessity of a more complete and multi-parametric analysis in the evaluation of patients with airway obstruction, using methodologies that explore the patient's functional state with the spirometry, but also the quality of the life through specific validated questionnaire.

It is necessary, therefore, to intensify the interventions and sanitary programs to reduce the environmental and lifestyle risk factors, to increase the diagnostic sensibility, to improve the control of the disease, to reduce the economic costs, and the working days tied for the COPD [16-18]. In fact, the COPD represents a great weight in the sanitary cures in the developed countries and many studies have determined that the hospitalisation costs represent a percentage between 40% and 57% of the total direct costs [13, 19, 20]. For this reason the COPD is an important emerging problem that requires urgent consideration from the authorities who managing sanitary systems. Trough territorial capillary strategies are needed to be given to manage the patients suffering with obstruction with obstruction via specialists and family physicians [21].

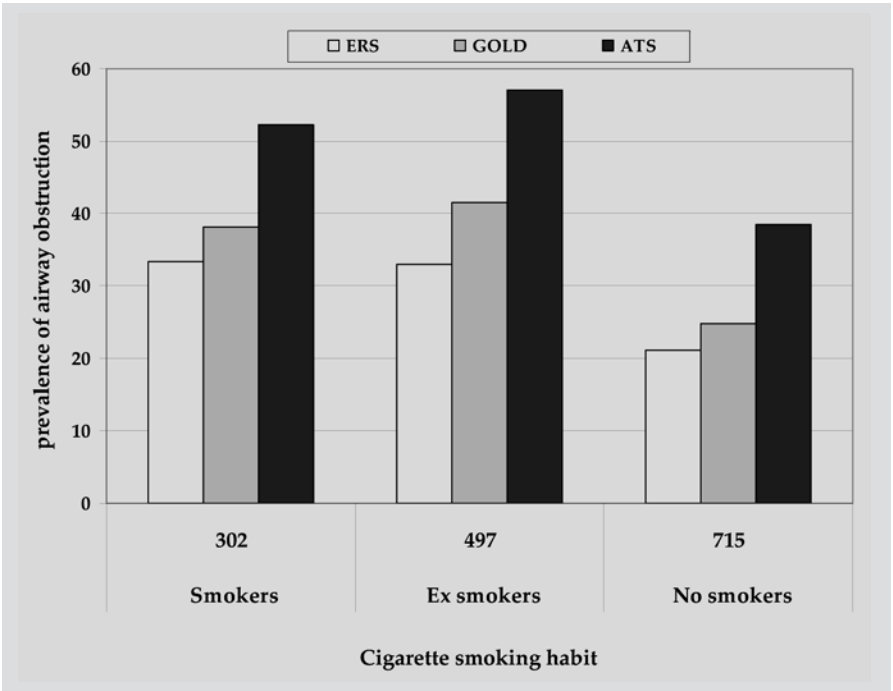

Fig. 2. - Prevalence of airway obstruction and cigarette smoking habit.

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