Epidemiology and Prevalence of Chronic Obstructive Pulmonary Disease

Enrique Diaz-Guzman, MD[a], David M. Mannino, MD[a,b,*]

KEYWORDS

• Chronic obstructive pulmonary disease • Prevalence • Trends • Epidemiology

KEY POINTS

- In most studied countries, about 8% to 10% of the adult population has chronic obstructive pulmonary disease, with cigarette smoking as the main risk factor.
- Occupational and environmental exposures are important in the development and progression of chronic obstructive pulmonary disease, particularly in the developing world.
- Recent data suggest that rates of chronic obstructive pulmonary disease morbidity and mortality are starting to decrease in some parts of the world.

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a preventable and treatable disease characterized by progressive airflow limitation and represents one of the most prevalent human health disorders in the world.[1] Although mortality associated with cardiovascular disease has been significantly reduced during the last 2 decades, the number of deaths associated with COPD has almost doubled, and COPD is now the fourth leading cause of death globally. More than 15 million people have the disease in the United States[2] and more than 210 million globally.[3] Despite significant public health efforts aimed to better understand and prevent the burden of this disease, the World Health Organization (WHO) has predicted that COPD will become the third most common cause of death in the world by 2030.[4] Moreover, prevalence estimates suggest that up to a quarter of adults 40 years or older have evidence of airflow obstruction.[5] Because of the increase in prevalence, many efforts have been made to measure the epidemiology of COPD at national and international levels. Studies such as the Global Burden of Disease (GBD) and the Global Initiative for Chronic Obstructive Lung Disease (GOLD), have affected our understanding of the burden and impact of chronic respiratory disease.[6,7] This review provides a summary of the most important recent reports addressing the epidemiology of COPD and a description of new COPD guidelines.

DEFINITION OF COPD

The most recent GOLD guidelines define COPD as "a common preventable and treatable disease characterized by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the

Conflict of Interest Statement: E. Diaz-Guzman reports no conflicts of interest. D.M. Mannino has served as a consultant for Boehringer Ingelheim, GlaxoSmithKline, Astra-Zeneca, Novartis, Merck and Forest and has received research grants from GlaxoSmithKline, Novartis, Boehringer-Ingelheim, Forest and Pfizer.

[a] Division of Pulmonary, Critical Care, and Sleep Medicine, University of Alabama at Birmingham, 625 19th Street, Birmingham, AL 35249, USA; [b] Department of Preventive Medicine and Environmental Health, University of Kentucky College of Public Health, 111 Washington Avenue, Lexington, KY 40536, USA

* Corresponding author.

E-mail address: dmannino@uky.edu

Clin Chest Med 35 (2014) 7–16

http://dx.doi.org/10.1016/j.ccm.2013.10.002

0272-5231/14/$ – see front matter

airways and the lungs to noxious particles or gases. Exacerbations and comorbidities contribute to the overall severity in individual patients."[7] Although this definition includes the major components of the disease, in practice, COPD consists of different clinical syndromes whose definitions vary according to the presence or absence of symptoms and measures of airflow limitation and reversibility. The following components are frequently considered when defining COPD.

Measures of Airflow Limitation and Reversibility

Airflow limitation, defined as a reduction in velocity of expiratory airflow, consists of a low forced expiratory volume in 1 second (FEV_1) and a low FEV_1 to forced vital capacity (FVC) ratio despite bronchodilator therapy. An FEV_1/FVC ratio of less than 70% continues to be used to identify airflow limitation in patients with COPD.[7,8] The use of lower limit of normal (LLN) values (based on the normal distribution of the population) has been proposed as a more specific tool to diagnose airflow limitation, but current GOLD and American Thoracic Society/European Respiratory Society guidelines continue to recommend the use of a fixed ratio instead of an LLN. Some studies have found that the use of a fixed FEV_1/FVC ratio will result in underestimation of COPD in patients less than 45 years of age (particularly those with mild disease), may overestimate the prevalence of COPD in older adults, and can result in misclassification in some patients.[9] Other studies, however, suggest that the use of a fixed ratio of 0.70 functions reasonably well in classifying most patients.[10]

In addition to airflow limitation, reversibility of airflow obstruction in response to an inhaled bronchodilator or to oral or inhaled corticosteroid is frequently used to identify patients who benefit from bronchodilator therapy.[7,11] Airflow reversibility, defined as an increase in FEV_1 of 200 mL and 12% improvement greater than baseline FEV_1, has been traditionally used to further characterize patients with airflow obstruction. Nevertheless, the degree of reversibility has not been found to increase sensitivity or specificity to diagnose COPD,[12] and current GOLD guidelines do not recommend the use of airflow reversibility as a criterion for the definition of COPD.[7]

Clinical Features and Overlap Syndromes

The characterization of COPD has included the terms *chronic bronchitis* (CB) and *emphysema*. CB is defined as the presence of a chronic productive cough for 3 months in each of 2 consecutive years provided that other medical causes have been excluded.[13] Emphysema is defined as the destruction of alveolar walls and permanent enlargement of the airspaces distal to the terminal bronchioles.[14] Although significant improvements in imaging technologies currently allow of the accurate detection of emphysema in most patients, significant variability in physician diagnosis of emphysema and CB exist, and current GOLD guidelines do not include the use of these terms in the definition of COPD.[7]

Asthma is defined as a "chronic inflammatory disorder of the airways in which many cells and cellular elements play a role. The chronic inflammation causes an associated increase in airway hyper-responsiveness that leads to recurrent episodes of wheezing, breathlessness, chest tightness and coughing, particularly at night or in the early morning. These episodes are usually associated with widespread but variable airflow obstruction that is often reversible either spontaneously or with treatment."[15] Asthma and COPD represent 2 distinct entities with different pathogeneses and risk factors; nevertheless, clinical features of both diseases may overlap, and large population studies have found that a high proportion of patients with respiratory problems are classified with more than one diagnosis (ie, asthma and chronic bronchitis or emphysema).[16,17] Moreover, overlapping diagnoses of asthma and COPD occur more commonly in patients older than 50 years, and its frequency increases with age.[16,18]

RISK FACTORS

The pathophysiology of COPD is complex, and the disease is related to genetic and environmental factors. In addition to smoking tobacco, additional important risk factors have been recognized as important and preventable causes of COPD in industrialized and developing countries. The list of risk factors associated with this condition is extensive and has been previously well described in the literature. Following is a brief description of the most commonly known risk factors in COPD.

Active and Passive Cigarette Smoking

There is overwhelming epidemiologic evidence that confirms that smoking tobacco remains the main risk factor for COPD. Several studies have found increased risk of airway obstruction measured by spirometry[19,20] and increased risk of COPD and hospitalizations for COPD exacerbations.[21] A 25-year follow-up study of the general population in Denmark that included 8045 men and women age 30to 65 years, found that the risk of COPD for continuous smokers was at least 25%.[22] The BOLD (Burden of Obstructive Lung