An overview of chronic obstructive pulmonary disease

**Abstract**

Chronic obstructive pulmonary disease is on the rise in the contemporary World. It is a preventable disease and rarely attributed to genetic deficiency. Several factors are responsible for this increased incidence, such as active and passive smoking, environmental pollution and occupational and delay of implementation of effective public policies for its prevention. The prevalence in the World varies greatly from 0.2% to 37%, this wide range is explained in part by cultural characteristics of countries that emitting international epidemiological reports, methods used to establish the diagnosis and classification of COPD. The prevalence and incidence has being higher in men, especially in the elderly above 75 years of age. Mortality has also increased in the last 30 to 40 years, 3-111 deaths per 100,000 populations. In Brazil, in 2011, the National Cancer Institute reported that 15.1% of the population of 190,732,694 people in Brazil is smokers and about 15% of this population could develop the COPD. Thus, in absolute numbers, 4.32 million people have COPD Brazilian, only related to smoking. COPD is the fourth leading cause of death in the United States, representing 5% of all deaths, with an increase of 8% of the total number of deaths from 116,494 to 126,005 in the period from 2000 to 2005. If the analysis is extended from 1980 to 2000, the percentage of mortality was increased in 67%. This chapter aims to demonstrate the importance of the epidemic, which is characterized by late onset and deterioration of lung function very slow, but that may be controllable by harsher measures of tobacco control in Brazil.

**Keywords**: Pulmonary disease, chronic obstructive; Smoking; Epidemiology.

**Concept**

Chronic obstructive pulmonary disease (COPD) is a preventable and treatable respiratory illness, which is characterized by the presence of persistent or partially reversible airflow obstruction. This airflow obstruction
is usually progressive and associated with an abnormal lung inflammatory response resulting from the inhalation of particles or toxic gases, with significant systemic consequences. Chronic inflammation can produce changes in the bronchi (chronic bronchitis), bronchioles (obstructive bronchiolitis), and lung (emphysema). The predominance of these changes varies in each individual, depending on the symptoms presented. In addition to this pathophysiological concept, COPD can also be defined by its functional diagnostic criteria: a ratio of forced expiratory volume in 1 second (FEV₁) to forced vital capacity (FVC) below 70% on spirometry post-bronchodilator. These criteria have been criticized by many scholars, as healthy individuals show a sharper decrease in FEV₁ than FVC as they age, which can result in a decreased ratio. Changing the diagnostic criteria to use the lower limit of normality might modify the epidemiology of COPD, particularly in the elderly.

Epidemiology

COPD is a global epidemic. In the past, the concept of an epidemic was mainly related to infectious diseases, and defined as a sharp and unexpected increase in the incidence. In the 1990s, the term “global epidemic” was used to characterize chronic diseases or metabolic states such as diabetes mellitus, obesity, hypertension, and COPD. The expansion of this concept was essential to the development of prevention and awareness strategies supported by the World Health Organization (WHO) and its geopolitical counterparts. The WHO reported that:

1) Sixty-five million people worldwide have moderate to severe COPD;
2) Over 3 million patients with COPD died in 2005;
3) In 2002, COPD was the fifth leading cause of death;
4) In 2020, COPD will be the third leading cause of mortality.

In addition, COPD is a major cause of morbidity worldwide. In Brazil, the prevalence of COPD is estimated at 7.3 million individuals (see epidemiological data for Brazil and Rio de Janeiro in table 1). As cigarette smoking was once more frequent in male individuals, mortality among men has already reached its peak. The subsequent increase in the incidence of smoking among women justifies the fact that the COPD mortality curve in women continues to rise. The mortality rate of women has already surpassed that of men in the United States (US), but not in Brazil.

The main etiology of COPD is cigarette smoking. The cessation of cigarette smoking would dramatically reduce the number of new COPD cases. For many years, it was estimated that only 15% of smokers developed COPD. Recently, it was demonstrated that continued smoking would result in airflow obstruction in

Table 1: Epidemiology of COPD in Brazil and Rio de Janeiro city (RJ).

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<tr>
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<tbody>
<tr>
<td>RJ</td>
<td>Male</td>
<td>2,122,684</td>
<td>594,351</td>
<td>382,083</td>
<td>6,319</td>
<td>2,079</td>
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<tr>
<td></td>
<td>Female</td>
<td>2,608,213</td>
<td>521,642</td>
<td>365,149</td>
<td>4,493</td>
<td>1,310</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>4,730,897</td>
<td>1,115,993</td>
<td>747,232</td>
<td>10,812</td>
<td>3,390</td>
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<tr>
<td>Brazil</td>
<td>Male</td>
<td>21,867,563</td>
<td>6,122,917</td>
<td>3,936,161</td>
<td>105,883</td>
<td>20,713</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>24,444,017</td>
<td>4,888,803</td>
<td>3,422,162</td>
<td>85,798</td>
<td>12,844</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>46,311,580</td>
<td>11,011,720</td>
<td>7,358,323</td>
<td>191,681</td>
<td>33,560</td>
</tr>
</tbody>
</table>

up to 50% of individuals aged above 70 years.5,6

The United States

In the US, COPD is the fourth leading cause of death, representing 5% of the total deaths. From 2000 to 2005, the total number of deaths from COPD increased by 8% (116,494 to 126,005). From 1980 to 2000, the total number of COPD-related deaths increased by 67%. In addition to the significant increase in the mortality rate, the cost per patient is also one of the highest ($6,300.00 USD) and the average hospital stay is 8.18 days, slightly shorter than that of chronic kidney disease patients (9.51 days).7-9

The control of prevalent noninfectious diseases has been conducted successfully (figure 1). However, COPD remains challenging to control. One reason for this difficulty is that other risk factors, beyond smoking, are linked to respiratory infections at young ages, history of asthma, occupational exposures, and aging of the lung itself.1

The main source of data on the prevalence of COPD in the US is the Third National Health and Nutrition Examination Survey study, which analyzed the results of a large American survey of 7,429 people and was conducted from 1988 to 1994. The participants were between the ages of 25 and 75 years and the study relied exclusively on spirometry values. Mild COPD was defined as FEV1/FVC ≥ 70% and FEV1 < 80% of predicted, which represented 6.9% of people. COPD (FEV1/FVC moderate < 70% and FEV1 ≤ 80%) was present in ≤6.6% of participants. The prevalence of both mild and moderate COPD was higher in men than in women, in Caucasian-Americans than in African-Americans, and increased sharply with age. Regardless of its severity, less than 50% of individuals with COPD were aware of their condition.3

Latin America

In Latin America, the Latin American Research Project on Pulmonary Obstruction study was performed in several Latin American countries, including Brazil. The cities chosen for this research included the city of São Paulo, Mexico City, Montevideo (Uruguay), and Caracas (Venezuela). The study determined the prevalence of COPD, which ranged from 7.8% to 19.8% in Uruguay and Mexico. In Brazil, the COPD prevalence was 15.8% in the city of São Paulo (figure 2).10-12

Brazil

The first population-based study published in the Brazilian literature was conducted by Me-nezes et al. in 1994 in inhabitants from Pelotas

Figure 1: COPD in some cities from Latin America.
town in Rio Grande do Sul, showing that the prevalence of chronic bronchitis in adults over 40 years was 12.7%.13

In Brazil, over last 20 years, the number of deaths from COPD has gradually increased in both sexes. In the 1980s the COPD mortality rate was 7.88 in 100,000 inhabitants and was 19.04 in the 1990s. In 2011, the National Cancer Institute of Brazil reported that 15.1% of the population of 190,732,694 million people were smokers; approximately 15% of these smokers have COPD. Consequently, the number of Brazilians with COPD is at least 4,320,000.6

Cost of COPD

In 2004, Miravitles published the cost of COPD in the Latin American countries. In Brazil, the respective costs of outpatient care, emergency visits, and hospitalizations were $25.00, $65.50, and $2,761.10 (USD).10 Colombia had the lowest values for outpatient and urgent care in relation to the other countries cited in the article.10 In Brazil, the annual cost of hospitalization per patient was among the highest in Latin America, only surpassed by Argentina ($3,120 USD), Ecuador ($2,800), and Venezuela ($3,086 USD). Although high, these numbers are underestimated because they do not account for indirect costs such as work absenteeism and early retirement.

In 2000, Sullivan et al. compared COPD with other highly prevalent respiratory diseases using data published in 1993 by the National Heart, Lung and Blood Institute of the US (table

Figure 2: COPD development in USA from 1965 to 1998.
Source: NHLBI/NH/NIH/DHHS.

Figure 3: Frequency of smoking in Brazilian population.
This analysis showed that COPD had an annual cost only lower than that of lung cancer, despite the high financial cost of its treatment.

Conclusions

COPD has a high social and economic cost to society. Patients are gradually unable to participate in their daily activities as a result of decreased respiratory capacity and need for continuous oxygen supplementation at home. Government policies of smoking cessation are fundamental to the control of this disease and should be stimulated and disseminated by the academic community.

References


Table 2: Cost, mortality and morbidity from main respiratory diseases in USA.

<table>
<thead>
<tr>
<th>Diseases</th>
<th>Total cost ($)</th>
<th>Direct medical ($)</th>
<th>Mortality (%)</th>
<th>Morbidity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>COPD</td>
<td>23.9</td>
<td>14.7</td>
<td>4.5</td>
<td>4.7</td>
</tr>
<tr>
<td>Asthma</td>
<td>12.6</td>
<td>9.8</td>
<td>0.9</td>
<td>0.9</td>
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<tr>
<td>Influenza Infection</td>
<td>14.6</td>
<td>1.4</td>
<td>0.1</td>
<td>13.1</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>7.8</td>
<td>1.7</td>
<td>4.6</td>
<td>1.5</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>1.1</td>
<td>0.7</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Lung Cancer</td>
<td>25.0</td>
<td>5.1</td>
<td>17.1</td>
<td>2.9</td>
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</tbody>
</table>
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