

# Prevalence of Chronic Obstructive Pulmonary Disease among Smokers Aged 45 and Up in Israel

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## Abstract

**Background:** Chronic obstructive pulmonary disease is an increasing cause of chronic morbidity and mortality around the world. The major cause of the disease is smoking. Despite the gravity of the problem there is no knowledge of its rate in the Israeli smoking population.

**Objectives:** To assess the prevalence of COPD and early lung cancer among smokers.

**Methods:** People aged 45 up to 75 with a history of at least 20 pack-years cigarette smoking, including quitters, were screened for COPD. They were interviewed and a spirometry was performed.

**Results:** Of the 1150 people recruited 92% underwent and performed acceptable spirometry; 22% of these subjects had airflow limitation and were diagnosed with COPD according to the GOLD classification. Only 4% had been diagnosed as COPD prior to this screening. The majority of those tested were unaware of or unconcerned about developing the disease. There was no correlation between pack-years smoking and development of COPD, but there was a relative correlation of pack-years smoking and severity of COPD, particularly in the older group ( $r = 0.42$ ).

**Conclusions:** About one-fifth of the smokers aged 45 and up developed COPD. There is a significant gap between the disease distribution and its awareness in the population at risk. The need for a national screening program and early diagnosis of COPD in people at risk is needed.

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Chronic obstructive pulmonary disease is a major cause of chronic morbidity and mortality around the world. Many people suffer from this disease for years and die prematurely from it or its complications. COPD is the fourth leading cause of death in the world, and further increases in its prevalence and mortality in the coming decades can be predicted [1]. The diagnosis of COPD should be considered in any person who has symptoms of cough, sputum production, dyspnea, or history of exposure to risk factors for the disease. The definitive diagnosis requires spirometry; namely, post-bronchodilator forced expiratory volume in the first second/forced vital capacity < 0.7 that is not fully reversible [2]. In the early stages, COPD can be asymptomatic, although episodes of coughing, often with sputum production, are not rare. At more advanced stages, when there are also symptoms of shortness of breath on exertion, a significant part of lung function may be reduced. The diagnosis of COPD

is usually established in the later stages, and this diagnostic delay may be due to either the patient's gradual adaptation to decreasing lung function or denial of the disease. In addition, doctors may be unaware of or do not respond to the patient's symptoms [2,3].

The main cause of COPD is smoking. The disease often manifests after the individual has been smoking more than 20 cigarettes a day over 20 years (20 pack-years) [4]. A smoker who is "sensitive" to cigarette smoke may therefore have spirometric changes from age 40 to 45 if they started smoking as a teenager or in the early twenties. It has been estimated that 15–20% of smokers develop COPD [5], but more recent research suggests that as many as 50% develop COPD if the smoker reaches an advanced age [6]. We conducted a survey that included both diagnosis of COPD and early detection of lung cancer in smokers aged 45 and over. This increased the rate of recruitment and was not restricted to any particular area.

## Patients and Methods

People aged 45 to 75 with a history of 20 pack-years cigarette smoking or more, including those who had quit, were enrolled in this study to screen for COPD and early lung cancer. They were interviewed and underwent spirometry, which was acceptable [7]. The interview questionnaire related to respiratory symptoms, use of medicines, past and present smoking habits (including exposure to environmental tobacco smoke), occupation, socioeconomic status, and family history of obstructive pulmonary diseases [8]. The questions on symptoms related to cough, sputum production, wheezing and dyspnea.

## Lung function test

The lung function test was performed with a dry spirometer (Jaeger, Hoechberg, Germany) according to the American Thoracic Society guidelines [9]. A reversibility test was conducted in subjects with a ratio of FEV1/FVC < 0.7, following inhalation of 0.2 mg Ventolin® (beta 2 agonist) and calculating the change in FEV1 and that ratio. COPD was classified according to the criteria developed by GOLD (Global initiative for Obstructive Lung Disease). The GOLD definition of COPD by spirometry requires a FEV1/FVC value < 0.7, after bronchodilatation. The classification

FEV1 = forced expiratory volume in the first second

FVC = forced vital capacity

COPD = chronic obstructive pulmonary disease

of smoking status was based on the subjects' answers. Thus, subjects who currently smoked every week or had stopped smoking within 12 months prior to the study were classified as smokers, while those who had quit more than 12 months previously were classified as ex-smokers.

### GOLD classification of COPD

*Mild* – FEV1/FVC < 0.70, FEV1  $\geq$  80% of predicted.

*Moderate* – FEV1/FVC < 0.70, 50%  $\leq$  FEV1 < 80% of predicted.

*Severe* – FEV1/FVC < 0.70, 30%  $\leq$  FEV1 < 50% predicted.

*Very severe* – FEV1/FVC < 0.70 FEV1 < 30% predicted or FEV1 < 50% predicted plus chronic respiratory failure.

### Statistical analysis

Statistical analyses were performed using the Statistical Web-Based package (Vassar College). Determinants for COPD were calculated by multiple logistic regression analysis; the independent variables were age, gender, and smoking habit. Odds ratios are reported with 95% confidence interval.  $P < 0.05$  was considered statistically significant.

### Results

Altogether, 1150 smokers were examined; 75% were males. Their age distribution is shown in Figure 1. The age group 55–64 comprised the highest number examined, while there was a similar representation of the older and younger groups.

### Prevalence of COPD

Ninety-two percent of the participants underwent spirometry, which was acceptable; in 22% airflow limitation was detected (indicating COPD). Most of the subjects already had moderate disease according to the GOLD classification [Figure 2].

### Relationship between smoking and COPD prevalence

No such relationship was found, although it should be taken into account that those who were screened included people who already had a history of at least 20 pack-years of smoking.

### Pre-screened data related to COPD

The questionnaires revealed that more than half the smokers were unaware of COPD. About three-quarters of the smokers were not concerned about getting COPD, which was in contrast to their worry about developing lung cancer. With regard to whether the diagnosis of COPD was made before the screening, only 50 (21% of COPD diagnosed) had responded positively [Table 1].

Spirometry results according to the GOLD criteria for diagnosis and classification of COPD demonstrated that 232 of the 1058 (22%) examined had COPD.

### Correlation between clinical presentation and level of FEV1

There was a direct correlation between staging of COPD and clinical presentation [Table 2]. Furthermore, examining the relationship between pack-year smoking and FEV1 showed a very low correlation ( $r = -0.24$ ). The same computation was performed for each stage of GOLD classification; Stages I and II showed

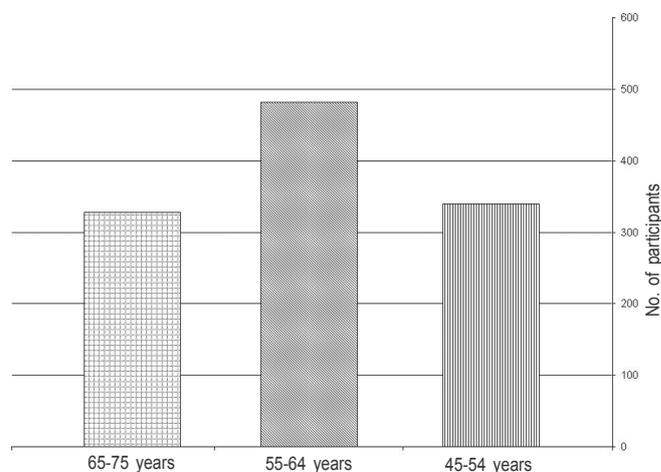


Figure 1. Population age distribution

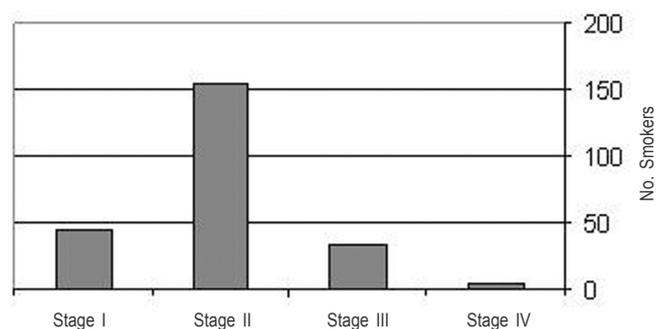


Figure 2. Prevalence of COPD cases according to the GOLD criteria, and distribution by disease severity

Table 1. COPD-related data in pre-screened subjects

	Awareness of COPD	Concern about COPD	Concern about lung cancer	Diagnosed COPD
Former smoker	86/128 (65%)	28/128 (22%)	115/122 (90%)	9/118 (8%)
Smoker	409/1022 (40%)	245/1022 (24%)	867/1022 (85%)	41/940 (4%)
Total	495/1150 (43%)	263/1150 (23%)	982/1150 (85%)	50/1058 (5%)

Table 2. Clinical presentation in subjects with COPD by different FEV1 levels

GOLD staging for COPD	I-FEV1 > 80%	II-FEV1 50% > FEV1 < 80%	III-FEV1 30% > FEV1 < 50%	IV-FEV1 FEV1 < 30%
Symptomatic	No	15%	65%	100%
Chronic productive cough	20%	15%	55%	60%
Physician-diagnosed chronic bronchitis, emphysema or COPD	0	5%	60%	100%
Use of medications	0	25%	60%	100%

a non-significant correlation between pack-year and severity of the disease, whereas in stage III the correlation value increased to  $-0.49$ . Stage IV was not statistically tested due to the small number of COPD patients.

## Discussion

This is the first large-scale population survey on smoking and the development of COPD in Israel. The screening had two objectives: early detection of lung cancer, and COPD diagnosis. Our impression was that limiting the survey to COPD diagnosis may have hampered the investigation due to low interest. This assumption was proved correct by the questionnaire results, which showed a low level of concern about developing COPD. The investigation disclosed that more than one-fifth of smokers developed COPD. In addition, less than one-fifth had been diagnosed with COPD prior to this survey. A possible explanation for the low rate of diagnosis according to the questionnaire was the lack of awareness about the risk of developing the disease. Secondly, as mentioned above, many smokers were not concerned about developing COPD. In addition, we found that in advanced age there is a good correlation between pack-years and severity of COPD, which was not true in the younger age groups.

Regarding similar surveys in other countries, Halbert and co-workers [10] reviewed the published studies on COPD prevalence and found that 16 studies had used a sampling strategy that was able to produce results representative of the entire population of a country. Only four of these studies used spirometry. The reported prevalence varies by the method used and ranged from 0.23 to 18.3%, and the symptom-based estimation exhibited the widest variation (range 1.12–18.3%). The prevalence rates were highly variable even when an objective tool such as spirometry was used, not only because of real differences in prevalence but because of differences such as age and the definitions of COPD used. In a recent Korean survey [11], about 36% of Korean adults older than 45 years with more than 20 pack-years of smoking had COPD by GOLD criteria. Physicians made the diagnosis in one-fourth of the subjects with COPD, and about 13% received medication. The Korean COPD incidence in smokers aged 45 years and over is highly significant compared to 22% in the Israeli population, furthermore, their physician diagnosis rate was higher. In a Swedish study testing 512 smokers aged 40–55 the prevalence rate of COPD was 27% [12]. Lunback et al. in a previous Swedish report [9] suggests that as many as 50% develop COPD if the smoker reaches advanced age.

In conclusion, COPD is an under-diagnosed progressive disease. There is an urgent need for national awareness and screening for early diagnosis of COPD in people at risk.

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