

EPIDEMIOLOGY OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

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ABSTRACT

COPD is a major cause of morbidity and mortality. Its social and economic burden is expected to increase worldwide in coming decades. COPD is under-recognised and under-diagnosed. It results in disproportionately more numbers of physician visits, emergency department visits and hospitalisations than most other diagnoses. It is increasingly recognised that COPD is commonly accompanied by co-morbid medical conditions, cardiovascular disease, hypertension, diabetes, osteoporosis, chronic kidney disease, cognitive impairment and depression, due to systemic inflammation which impact on quality of life and survival. The prevalence of COPD among adults aged 40 and above varies widely from 8% to 26%. The most widely recognised risk factor for COPD is smoking, but non-smoking factors include biomass fuel, occupational exposure to dusts and gases, history of pulmonary tuberculosis, chronic asthma, respiratory-tract infections during childhood, outdoor air pollution, and poor socioeconomic status.

Keywords:

disease burden, comorbidity, prevalence, smoking, social and environmental factors.

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INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a global health problem. It is a major cause of morbidity and mortality world-wide and carries a substantial and increasing economic and social burden. According to the World Health Organisation (WHO) Global Burden of Disease Study, COPD was the 6th leading cause of death worldwide in 1990; by 2030, it will be the 4th leading cause of death.¹ In terms of social burden of disease quantified by disability-adjusted life-years (DALYs) lost, COPD ranked as the 12th leading cause of DALYs lost worldwide in 1990, but will be the 7th leading cause of DALY lost worldwide in 2030.²

This global rise of COPD mortality and morbidity in the next decades is due to increasing trends in the proportion of older people in the population, limited progress in improving survival outcomes among COPD patients, high and increasing prevalence of risk factors for COPD. The global rise in morbidity and mortality from COPD will be particularly dramatic in the Asia-Pacific where two major recognised risk factors for COPD, tobacco smoking and indoor air pollution from domestic use of biomass fuel, remain highly prevalent.

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COPD is under-recognised and under-diagnosed.³ Published health statistics underestimate COPD as a cause of death due to the imprecise and variable diagnosis of COPD. COPD is more likely to be reported as a contributory rather than underlying cause of death or morbidity, or may not be reported at all. In elderly patients, most cases of COPD are undiagnosed, because they are attributed to old age or labelled as asthma. A past history of asthma is often elicited in patients with COPD, and is a recognised risk factor for COPD, but COPD and asthma as distinct co-existing diseases are seldom clinically recognised as such. In developing countries, past tuberculosis is also common, and recent studies support its role as a risk factor for COPD.

CLINICAL EPIDEMIOLOGY

In terms of *morbidity*, COPD results in disproportionately more numbers of physician visits, emergency department visits and hospitalisations than most other diagnoses. Among patients in Singapore, approximately two-thirds had at least one previous hospital readmission for acutely exacerbated COPD, and a half reported two or more previous hospital readmissions, some with 10 to 20 hospital admissions.⁴ The mortality rate of COPD patients within one year following hospital discharge was 17%.⁵

MEDICAL COMORBIDITY

More than three-quarters of hospitalised COPD patients have at least one co-morbid medical condition, commonly cardiovascular disease, hypertension, diabetes, osteoporosis, chronic kidney disease, cognitive impairment and depression.⁶ Current research suggest that a common underlying factor explaining the high medical co-morbidity of COPD is chronic systemic inflammation indicated by elevated levels of pro-inflammatory cytokines such as tumour necrosis factor (TNF)- α , interleukin-6, and C-reactive protein. In patients with COPD, elevated CRP levels have been found to be associated with reduced FEV₁, exercise capacity, metabolic and functional impairment, increased hospitalisation, all-cause and COPD mortality.^{7,8}

CLINICAL PROFILE

Studies of COPD inpatients in Singapore^{4,5} show that the majority of hospitalised patients were male (83%) and Chinese (81%). Significantly large proportions were divorced, widowed or single (32%), or lived in low end public housing apartments (1 to 3 rooms HDB) (46%). Almost all were either current or ex-smokers, because of diagnostic pre-selection (a diagnosis of COPD is preferentially made if the patient is a smoker). There were high prevalence of underweight (50% have BMI<18,

reflecting muscle wasting/ sarcopenia), depression (45% had HAD score ≥ 8), and use of psychotropic drugs was particularly high among frequently readmitted patients (13%). Inadequate or poor caregiver support is common (35% reported no caregiver support at all, and only 38% subjects reported fair to good care giver support).

Uptake of pulmonary rehabilitation was low at 13%. The large majority (88%) did not receive influenza or pneumococcal vaccination in the past one year. Male sex, longer disease duration (>5 years), poor pulmonary function ($FEV_1 < 50\%$ predicted) and use of psychotropic drugs were associated with frequent readmissions for AECOPD. Among hospitalised AECOPD patients who were followed up for one year after discharge, the presence of prior depressive symptoms identified during the index hospitalisation was shown to be associated with two times increased rate of mortality, more early and frequent readmissions, failed smoking cessation, worse symptom burden, poorer functional status and quality of life.⁵

POPULATION PREVALENCE AND RISK FACTORS

Increasing numbers of population studies worldwide in recent years have estimated the prevalence of COPD using standard diagnostic criteria recommended by Global Initiative for Chronic Obstructive Lung Disease (GOLD)³ based on post-bronchodilatation spirometry ($FEV_1/FVC < 0.70$). These show considerably high rates of COPD more than were traditionally reported based on physician diagnosis ($< 6\%$). The

Burden of Obstructive Lung Disease (BOLD) studies⁹ showed COPD ($FEV_1 < 0.70$) among adults aged 40 and over varied widely among 12 countries from 11.4% to 26.1%.

The Latin American Project for the Investigation of Obstructive Lung Disease (PLATINO)¹⁰ reported COPD prevalence among 5 Latin American cities to vary from 7.8% to 19.7%. Higher prevalence among men than women was reported in some studies, but no gender differences were observed in European countries.

Although the higher prevalence of COPD among smokers than non-smokers is well established by these studies, it is important to note that about 3 to 10% of non-smokers also have COPD, indicating that non-smoking risk factors are also important.¹¹ An estimated 25% to 45% of individuals with COPD have never smoked. Non-smoker risk factors include biomass fuel, occupational exposure to dusts and gases, history of pulmonary tuberculosis, chronic asthma, respiratory-tract infections during childhood, outdoor air pollution, and poor socioeconomic status.

Data from the Singapore Longitudinal Ageing Studies show similar prevalence and pattern of risk factors.¹² (Table 1) Of note, the prevalence of COPD was no higher in women than men, although hospital cases tend to comprise more men than women; greater prevalence with increasing age; considerably higher prevalence among current smokers, but note that 24% of non-smokers also show COPD; occupational exposure and history of asthma are non-smoking risk factors.

TABLE 1. PREVALENCE OF COPD ($FEV_1/FVC < 0.70$) AMONG 2479 CHINESE PARTICIPANTS AGED 55 AND ABOVE IN THE SINGAPORE LONGITUDINAL AGEING STUDIES.

Demographic characteristics	COPD %	P value
Overall	26.0	
Male	26.1	0.89
Female	25.9	
Age: 55-64	20.9	<0.001
65 – 74	29.6	
75+	34.8	
1-3 Room public housing	34.4	<0.001
4-5 Room public housing	25.4	
Private and Landed housing	18.6	
Never Smoker	24.3	<0.001
Past Smoker	26.3	
Current Smoker	47.1	
Past occupational exposure to dust, fumes or gases: No	25.4	0.002
Yes	37.7	
History of asthma: No	25.1	<0.001
Yes	52.6	

Reducing the personal toll of COPD on patients and its social and economic burden on families and the health care system requires primary care and public health interventions. These include better diagnostic awareness in primary care, understanding the personal and clinical factors that influence clinical outcomes, and early modifications of environmental and lifestyle risk factors that predispose to the development of obstructive pulmonary disease.

REFERENCES

1. World Health Organization. Burden of COPD. <http://www.who.int/respiratory/copd/burden/en/>.
2. Murray CJL, Lopez AD. Evidence-based health policy -lessons from the Global Burden of Disease Study. *Science* 1996; 274:740-3.
3. Global Initiative for Chronic Obstructive Lung Disease, 2006. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease. <http://goldcopd.org/Guidelineitem.asp?l1=2&l2=1&intld=996>.
4. Cao Z, Ong KC, Eng P, Tan WC, Ng TP. Frequent hospital readmissions for acute exacerbation of COPD and their associated factors. *Respirology*. 2006 Mar;11(2):188-95. PubMed PMID: 16548905.
5. Ng TP, Niti M, Tan WC, Cao Z, Ong KC, Eng P. Depressive symptoms and chronic obstructive pulmonary disease: effect on mortality, hospital readmission, symptom burden, functional status, and quality of life. *Arch Intern Med*. 2007 Jan 8;167(1):60-7. PubMed PMID: 17210879.
6. Barnes PJ, Celli BR. Systemic manifestations and comorbidities of COPD. *Eur Respir J*. 2009 May;33(5):1165-85. doi:

- 10.1183/09031936.00128008. Review. PubMed PMID: 19407051.
7. Broekhuizen R, Wouters EF, Creutzberg EC, Schols AM: Raised CRP levels mark metabolic and functional impairment in advanced COPD. *Thorax* 2006, 61:17-22.
8. Man SF, Connett JE, Anthonisen NR, Wise RA, Tashkin DP, Sin DD: C-reactive protein and mortality in mild to moderate chronic obstructive pulmonary disease. *Thorax* 2006, 61:849-853.
9. Buist AS, McBurnie MA, Vollmer WM, Gillespie S, Burney P, Mannino DM, Menezes AM, Sullivan SD, Lee TA, Weiss KB, Jensen RL, Marks GB, Gulsvik A, Nizankowska-Mogilnicka E; BOLD Collaborative Research Group. International variation in the prevalence of COPD (the BOLD Study): a population-based prevalence study. *Lancet*. 2007 Sep 1;370(9589):741-50. Erratum in: *Lancet*. 2012 Sep 1;380(9844):806.
10. Menezes AM, Perez-Padilla R, Jardim JR, Muiño A, Lopez MV, Valdivia G, Montes de Oca M, Talamo C, Hallal PC, Victora CG; PLATINO Team. Chronic obstructive pulmonary disease in five Latin American cities (the PLATINO study): a prevalence study. *Lancet*. 2005 Nov 26;366(9500):1875-81.
11. Salvi SS, Barnes PJ. Chronic obstructive pulmonary disease in non-smokers *Lancet* 2009; 374: 733–43.
12. Ng TP, Niti M, Fones C, Yap KB, Tan WC. Co-morbid association of depression and COPD: a population-based study. *Respir Med*. 2009 Jun;103(6):895-901. doi:10.1016/j.rmed.2008.12.010. Epub 2009 Jan 10. PubMed PMID: 19136238.

LEARNING POINTS

- **COPD results in disproportionately more numbers of physician visits, emergency department visits and hospitalisations than most other diagnoses.**
 - **COPD is underestimated as a cause of death -- because COPD is more likely to be reported as a contributory rather than underlying cause of death or morbidity.**
 - **Most cases of COPD in the elderly are undiagnosed – because their symptoms are attributed to old age or labelled as asthma.**
 - **COPD is increasingly recognised to be accompanied by co-morbid medical conditions, cardiovascular disease, hypertension, diabetes, osteoporosis, chronic kidney disease, cognitive impairment and depression, due to systemic inflammation which impact on quality of life and survival.**
 - **The prevalence of COPD among adults aged 40 and above varies widely from 8% to 26%.**
 - **The most widely recognised risk factor for COPD is smoking.**
 - **Non-smoking factors are also important - use of biomass fuel, occupational exposure to dusts and gases, history of pulmonary tuberculosis, chronic asthma, respiratory-tract infections during childhood, outdoor air pollution, and poor socioeconomic status.**
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