Prevalence of chronic obstructive pulmonary disease among stable chronic disease subjects in primary care in Trinidad, West Indies

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ABSTRACT The prevalence of COPD in the Caribbean is uncertain. Spirometric indices were assessed at chronic disease clinics in 353 subjects (African, 66; East Indian, 198; 109 male), mean age 56.51 years (non-COPD) vs 59.30 years (COPD). 77 (21.8%) patients had COPD. 33.3% of COPD subjects had chronic cough vs 19.7% of subjects without COPD. A history of at least one chest infection was related to low FEV1 (P=0.005). In subjects presenting with vascular disease the FVC was reduced when compared to other subjects. Prevalence of COPD is 21.8%. A history of chest infections is related to decreased FEV1%.

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Introduction

Chronic obstructive pulmonary disease (COPD) is a leading cause of death worldwide (1). It is a disease that represents a major health problem as it leads to increased disability in subjects, with increased health burden on the society (2). COPD is a progressive disease associated with airway inflammation and is characterized by airflow limitation that is not fully reversible and which is measured by the ratio of the forced expiratory volume in one second (FEV1) to the forced vital capacity (FVC) (3). The severity of COPD is ascertained by decrease in FEV1% predicted for age and height (FEV1%) (3).

Accurate information on disease prevalence of COPD is important to understand its impact on disability, quality of life and healthcare costs, and to inform on public health planning (4). Baseline prevalence rates also allow epidemiological analysis to monitor trends, and determine the success or failure of control efforts.

Despite the worldwide high prevalence of COPD, studies of airway diseases in Caribbean territories have concentrated on asthma. The single study which looked at the prevalence of COPD in Trinidad using measurements of lung function was a 2004 study of 720 acute medical admissions at the General Hospital, Port of Spain which showed that COPD was present in 21% of acute medical admissions. The study also showed that subjects with a low FEV1 were more likely to have cardiovascular disease (5).

In a follow-up study to this, Cho Fook Lun et al. showed that subjects with COPD are more likely to have higher levels of CRP and homocysteine, (which are biochemical markers of inflammation and cardiac risk), compared to age and sex-matched controls (6). Based on these findings we hypothesized that COPD is highly prevalent in subjects with chronic disease in Trinidad. The setting was in chronic disease clinics in the primary health centers in Trinidad. We described relationships between lung function variables and explanatory variables in the population studied.

Methodology

Ethical permission for the study was obtained from the appropriate regional Health Authorities and from the Ethics Committee of the Faculty of Medical Sciences, University of the West Indies (St. Augustine Campus), prior to recruitment of subjects. All subjects gave informed written consent.

The study was conducted at five regional health centre chronic disease clinics at Arima, Chaguanas, Couva, Freeport and Marabella, all in Trinidad.

No potential conflict of interest.

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Inclusion and exclusion criteria

Subjects over the age of eighteen (18) years attending the chronic disease clinics at the aforementioned health centers during the period June – August 2006 were sampled, as they presented. Patients were excluded only if spirometry was contraindicated according to ATS criteria (7). Additionally, some patients were excluded if they were being treated with beta-blockers, upon the request of their physicians.

Dyspnoea was assessed using the Modified MRC Dyspnoea Scale (8) and post-bronchodilator spirometric indices were assessed according to the guidelines of the American Thoracic Society (ATS) (7) by open-circuit testing. Data that was included in the analysis satisfied the parameters of acceptability and reproducibility (9). Subjects were classified into smokers and never-smokers; and by number of cigarettes used per day or grams of tobacco smoked per week. Patients were also asked to recall the number of chest infections requiring antibiotics or hospital admission within the past year.

A patient was taken as having vascular disease if any one or more of the following was stated in the medical notes: stroke, ischaemic heart disease, myocardial infarction, hypertension, congestive cardiac failure (with HTN and/or diabetes mellitus), or cardiac arrhythmia due to ischaemic heart disease and/or heart block (5).

Statistical analysis

Data was expressed as mean (standard deviation, SD) where normally distributed and otherwise as median (interquartile range, IQR). Statistical significance was taken at the 5% level. FEV1% predicted was normally distributed but other lung function parameters were not; thus, bivariate relationships were examined by Spearman's correlations. Variables having significant univariate relationship to FEV1% predicted at or less than the 10% level of significance were included in a backward stepwise linear regression. Some variables known to have significant relation to FEV1% from published data were also forced into the multivariate analysis: BMI, age and gender. For this analysis, skewed data were dichotomized about the median and binary coded. Backward stepwise logistic regression was also used to analyze multivariate relationships to the presence (or absence) of vascular disease. SPSS version 12 for windows was used for analysis.

Results

Exclusions

69 patients were excluded from the study as follows; (2.9%) hemoptysis of unknown origin, (14.5%) unstable cardiac status, (7.2%) recent eye, thoracic or abdominal surgery, (8.7%) confused subjects, (1.4%) cannot sit up even with assistance, (8.7%) severe chest and abdominal pain, (42.0%) beta blocker on physician's advice, (14.5%) left clinic before test was done.

Demographics

A total of 353 subjects were included of which 66 were of African ethnicity,198 were East Indians and 89 were classed as 'other'. There were 77(21.81%) patients with a spirometric diagnosis of COPD, and these patients were older (P=0.05) with lower BMI (P=0.08) than patients without COPD. There was no difference in ethnicity between the two groups of patients (Table 1).

Comorbidity within the clinics

The major chronic diseases managed in the clinics were angina (n= 53; 15%), cardiac failure (n=6, 1.7%), diabetes (n=159; 45%), HTN (n= 230, 65.2%). 48.7% of patients in the clinic had one of these conditions and 33.1% had two. Further, as might be expected in a clinic with 45% diabetics, 36% patients had a BMI of more than 30 kg per square meter.

Smoking history and symptoms

75(27.2%) of the non- COPD patients were smokers whereas 30(39.0%) of the COPD patients were smokers, (P=0.045). The non-COPD smokers had a smoking burden of 5.12 (16.4) pack years while the COPD smokers had a burden of 8.26(23.4) pack years.

Spirometry and symptoms

Patients with COPD had significantly lower FEV1 and FEV1% predicted but not FVC compared with the non-COPD group (Table 2). As opposed to 54(19.7%) of the non- COPD patients who had chronic cough, 25(33.3%) of the COPD patients reported this symptom (P=0.01). 39(14.2%) of the non- COPD patients complained of chronic sputum production, while 16(21.3%) of the COPD patients had cough with expectoration. There was no difference between the two groups of patients on MRC dyspnoea grade.

Vascular disease

248(70.25%) subjects had vascular disease. In subjects with vascular disease the median FVC was lower [2.18 (1.76, 2.66) L] than those without vascular disease [2.40 (1.98, 2.92) L] (Fig 1). Of the 248 patients with vascular disease, 55 (22.18%) had COPD. Several factors correlated with presence of vascular disease: FEV1 (-0.150, 0.0074), FVC% (-0.137, 0.014), age

Table 1. Demographic data, past medical history, smoking history and MRC Dyspnoea grades for COPD and non-COPD patients

Variable	Non-COPD patients n=276	COPD patients n=77	*P* value
Age/years mean (SD)	56.51 (11.28)	59.30 (10.93)	0.052
Body mass index mean (SD)	29.19 (5.76)	27.95 (5.54)	0.088
Height/metres mean (SD)	1.61 (9.15)	1.63 (10.50)	0.149
Gender n (%)			0.083
Male	79 (28.6)	30 (39.0)	
Female	197 (71.4)	47 (61.0)	
Ethnicity n (%)			0.795
East Indian	154 (55.8)	44 (57.1)	
African	54 (19.6)	12 (15.6)	
Other	68 (24.6)	21 (27.3)	
At least one chest infection/lifetime n (%)	73 (26.4)	19 (24.7)	0.754
Chest admissions/last year n (%)	5 (1.8)	2 (2.6)	0.662
At least one hospital admission/ last year n (%)	32 (11.6)	10 (13.0)	0.739
Smokers n (%)	75 (27.2)	30 (39.0)	0.045
Pack years mean (SD)	5.12 (16.4)	8.26 (23.4)	0.272
Symptoms n (%)			
Chronic cough	54 (19.7)	25 (33.3)	0.012
Chronic sputum	39 (14.2)	16 (21.3)	0.135
MRC Dyspnoea grade n (%)			
MRC stage 0 or 1	227 (82.5)	57 (74.0)	0.094
MRC stage 2, 3 or 4	48 (17.5)	20 (26.0)	

Table 2. Lung function parameters between COPD and non-COPD subjects

Variable	Non-COPD patients n=276	COPD patients n=77	*P* value
Lung function parameters median (IQR)			
FEV_1/L	1.82 (1.47, 2.20)	1.44 (1.10, 1.72)	0.0010
FEV_1 % predicted	67.60 (57.59, 76.73)	52.31 (40.76, 61.21)	0.0010
FVC/L	2.21 (1.80, 2.69)	2.41 (1.86, 2.93)	0.063
FVC% predicted	66.33 (57.72, 75.30)	68.35 (58.87, 77.25)	0.205
FEV_1/ FVC (%)	81.19 (75.92, 86.87)	61.75 (53.74, 66.73)	0.000

(0.205, ≤0.001), BMI (0.159, 0.004), but not FEV1% predicted or FEV1/FVC (P>0.12 in both cases). When these correlated variables were entered into a multivariate logistic regression with presence of vascular disease as an outcome variable FVC% (-0.014, 0.061), Age (0.042, < 0.001), BMI (0.776, 0.003) were found to be independently related to vascular disease.

Chest infections

Subjects who were able to recall having at least one chest infection were more likely to have a low FEV1 or FVC (Table 3). Patients with at least one admission for a chest infection were more likely to have a low FEV1, FEV1% or FVC %. Multivariate linear regression with FEV1% as outcome variable revealed independent relationships with high BMI, FVC%, history of at least one chest infection and history of smoking (Table 4).

Discussion

This is the first study to assess the prevalence of COPD in patients with chronic disease in a West Indian setting. Patients reporting a diagnosis of asthma were excluded from GOLD stage classifications. COPD was more prevalent amongst females and those with a history of smoking but only 39% of COPD patients

Table 3. Spearman's correlations between lung function, chest admissions and lower respiratory tract infections and the number of subjects with at least one chest admission in the last year

Variable	At least one lower respiratory tract infection in lifetime		At least one admission for a chest condition in the past year	
	Rho	P	rho	P
Chest hospital admissions in last year	0.100	0.059	1.000**	0.0010
Best FEV1	-0.158**	0.003	1.300*	0.015
FEV1% predicted	-0.175**	0.001	-0.176**	0.001
Best FVC	-0.152**	0.004	-0.096	0.071
FVC% predicted	-0.109*	0.041	-0.137*	0.010
FEV1/FVC ratio	-0.046	0.358	-0.053	0.0321

**. Correlation is significant to the 0.01 level (2-tailed); *. Correlation is significant to the 0.05 level (2-tailed).

Table 4. Multivariate analyses using linear regression with FEV1 % predicted as the dependent variable. Only parameters with significant relationship with FEV1% are shown

	Regression co-efficient	*P*-value
Intercept	10.82	<0.001
BMI	2.072	0.05
At least one chest infection/ lifetime	-3.406	0.005
FVC % Predicted	0.799	<0.001
Smoker	-2.827	0.016

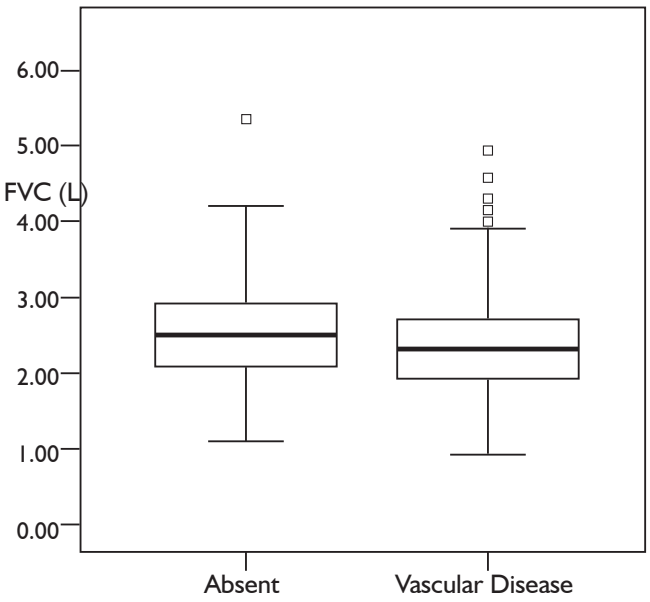

Fig 1. Graph illustrating median values and inter-quartile ranges of FVC for subjects with vascular disease compared to those without vascular disease. (Mann Whitney U-Test, p 0.007)

admitted to a history of smoking.

The prevalence of COPD was higher in women than men in our study but this was because more women attended the health centers sampled though there is substantial evidence to suggest that women may be predisposed to suffer adverse respiratory consequences of tobacco smoke with greater impairment of lung function and earlier COPD development (10). COPD surveillance data from the United States has shown increased mortality rate in females compared to males (11). It may be argued however that women, having higher life expectancies, may simply be living longer so as to succumb to the effects of smoking. Additionally there is substantial data to suggest that further study into gender differences in COPD should be investigated as differences exist in the clinical manifestations of COPD, as well as its gender prevalence (12-14).

It should be noted that smoking may not be totally responsible for the higher prevalence of COPD in females in our study. Other known risk factors for the development of COPD include air pollution, infections and occupational exposures. Air pollution, particularly fine particulate indoor air pollution from biomass fuels disproportionately affects women. Studies have shown that women are more susceptible to the effects of biological or organic dust exposure reflected by an increased prevalence of respiratory symptoms and chronic bronchitis (15). Exposure to occupational dust has been shown to be related

to higher COPD prevalence as well, especially in women (16). The BOLD study found that Cape Town, South Africa had the highest prevalence of stage 2 or higher COPD as well as high levels of occupational dust exposure as well as smoking rates (17). In our study, most patients with COPD were in stage II (53.2%), a finding that may hint at the need for further investigation of occupational exposure in the development of COPD in Trinidad. Measures may be needed to decrease such exposures, promote cleaner fuels, improved stoves, better home ventilation and reduce toxic dust and fume exposures.

Smoking is the major known environmental risk factor for the development of COPD and as expected, it was found that a higher proportion of patients with COPD were smokers compared to the non-COPD patients. Consistent with this was the finding that FEV1% was lower in smokers. Further as previously found COPD patients smoked for a greater number of pack years than non-COPD patients. A greater percentage of COPD patients had chronic cough, linking smoking pack years and development of these symptoms. This finding is especially intriguing as one study has shown that cough may be a better predictor of airflow limitation and when used to preselect smokers for spirometry testing, the proportion with an FEV1 less than 80% was increased. Thus increased emphasis on respiratory symptoms in smokers may aid in the detection of COPD by targeting higher risk patients (18). Studies have also shown that the prevalence of undetected airflow limitation is high among asymptomatic smokers, a finding that supports the need for targeted screening of patients who present with chronic cough, and dyspnoea (19).

Comorbid conditions were very common in our study and previous studies have confirmed that pulmonary function, represented by FEV1, is an independent risk factor for Ischemic Heart Disease mortality (20). In fact, 71.4% of COPD patients in our study presented with cardiovascular disease, indicating a major link with reduced lung function suggesting that greater emphasis should be given to investigation of comorbid conditions by West Indian physicians in the management of COPD. Further, individuals with COPD are more likely to be at risk of vascular events due to preexisting cardiovascular disease (21).

We also observed that in patients presenting with cardiovascular conditions, FVC values were significantly lower than in patients without vascular disease. It has been postulated that diminished respiratory function as measured by FVC is associated with increased risk of cardiovascular mortality but this is largely unexplained. However previous studies by Friedman et al (22) suggest that clinical research investigating predictive value of FVC is necessary, in line with our findings.

Our study has limitations. The cross-sectional design limits our ability to describe progression of the stages of COPD. In patient recruitment, our study focused on outpatient clinics so that our sample did not represent those who do not attend these health centers and it is likely that there was a gender bias in sampling because of this. The non-COPD patients had reduced FEV1 and FVC as estimated from that predicted for age and height and gender. This is not unexpected as the patients were recruited from the chronic disease clinics of the primary care system. Diabetes, obesity and cardiac failure are associated with a restrictive ventilatory defect. Thus because of reduced FVC, we may have missed some of the COPD patients within these chronic disease clinics.

With COPD prevalence being found to be more or less the same in chronic disease patients as in the acute setting of the Port-of-Spain hospital study (21%) (5), this study should prompt further investigation into disease prevalence and its morbidity in the general population. Additionally, it is hoped that the new unearthing of data relating lung function to chest infections in our patients, will lead to greater emphasis on spirometry in our patients and thus to more appropriate management of airways diseases.

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