ORIGINAL ARTICLE

# A Descriptive Study of Chronic Obstructive Pulmonary Disease in Tertiary Care Clinics of a Caribbean Island

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## *ABSTRACT*

***Objective:*** *To determine the relationship between severity of chronic obstructive pulmonary disease (COPD) and quality of life as well as COPD's correlation with depressive symptoms in West Indian subjects.*

***Methods:*** *This is a cross-sectional, observational study of outpatients with COPD in tertiary care. The severity of COPD was determined by the Global Initiative for Chronic Obstructive Lung Disease (GOLD) stage, GOLD group, and body mass index, airflow obstruction, dyspnoea and exercise capacity (BODE) index. Quality of life was assessed by the St George Respiratory Questionnaire (SGRQ) and COPD Assessment Test (CAT), and depression was assessed by the Center for Epidemiologic Studies Depression Scale (CES-D).*

***Results:*** *A total of 105 patients (85.7% male, 37.1% Indo-Trinidadian, 42.9% Afro-Trinidadian, 64.8% primary level education) were recruited with a mean age of 66.9 years (standard deviation: 9.60 years). The median body mass index was 25 kg/m$^2$; 26.7% were underweight. Risk factors identified were: ever-smokers (27.6%), marijuana (20%), biomass (81.9%), passive smoke (70.5%), occupational exposures (80%). The CES-D of 25% of the patients was ≥ 16. Co-morbidities included diabetes (22%), hypertension (29%), gastro-oesophageal reflux disease (10%) and previous myocardial infarction (15%). A total of 59% of the patients reported a monthly household income of less than US$800. Lower level of education was associated with worse SGRQ (total and impact), lower forced expiratory volume in one second, modified Medical Research Council scale (mMRC) of ≥ 2 and higher BODE index. Higher GOLD group correlated with worse SGRQ, CAT and CES-D. Higher CES-D was associated with shorter six-minute walk distance, worse SGRQ, CAT and mMRC scores, higher GOLD group and increased COPD admissions per year. Patients with a CES-D of ≥ 16 walked shorter distances. Higher BODE quartile was associated with worse SGRQ, CAT and CES-D scores.*

***Conclusion:*** *Higher GOLD group and higher BODE quartile were associated with worse quality of life scores and higher depression scores. Patients in higher GOLD groups should be screened for depression. Education on COPD should be targeted at those of lower socioeconomic status.*


**Keywords:** BODE index, chronic obstructive pulmonary disease, depression, ethnicity, quality of life, socioeconomic status

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# Estudio descriptivo de la enfermedad pulmonar obstructiva crónica en clínicas de atención terciaria de una isla caribeña

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## *RESUMEN*

***Objetivo:*** *Determinar la relación entre la severidad de la enfermedad pulmonar obstructiva crónica (EPOC) y la calidad de vida, así como la correlación de la EPOC con síntomas depresivos en sujetos antillanos.*

***Métodos:*** *Se realizó un estudio observacional transversal de pacientes ambulatorios con EPOC en cuidados terciarios. La severidad de la EPOC fue determinada por la etapa de la Iniciativa Global para la Enfermedad Pulmonar Obstructiva Crónica (GOLD, en inglés), el grupo GOLD, así como el índice de masa corporal, la obstrucción del flujo de aire, la disnea y la capacidad de ejercicio (índice BODE). La calidad de vida fue evaluada mediante el Cuestionario Respiratorio de Saint George (CRSG) y la prueba de evaluación de la EPOC (CAT, en inglés), en tanto que la depresión fue evaluada por la Escala de Depresión del Centro de Estudios Epidemiológicos (CES-D).*

***Resultados:*** *Un total de 105 pacientes (85.7% varones, 37.1% indotrinitenses, 42.9% afrotrinitenses, 64.8% nivel de educación primaria) fueron reclutados con una edad promedio de 66.9 años (desviación estándar: 9.60 años). El índice de masa corporal promedio fue de 25 kg/m$^2$; 26.7% por debajo del peso normal. Los factores de riesgo identificados fueron: fumar ocasionalmente (27.6%), marihuana (20%), biomasa (81.9%), humo pasivo (70.5%), exposición ocupacional (80%). El CES-D del 25% de los pacientes fue ≥ 16. Las comorbilidades incluyeron diabetes (22%), hipertensión (29%), enfermedad por reflujo gastroesofágico (10%), y previo infarto del miocardio (15%). Un total de 59% de los pacientes reportaron un ingreso mensual familiar de menos de $800 USD. El nivel más bajo de educación se asoció con un peor (CRSG) (total e impacto), menor volumen espiratorio forzado en un segundo, Escala del Consejo de Investigaciones Médicas modificada (mMRC) de ≥ 2, y más alto índice de BODE. Un grupo más alto de GOLD se correlacionó con peores resultados de CRSG, CAT y CES-D. El CES-D más alto se asoció con una caminata de una distancia más corta en seis minutos, peores puntuaciones de CRSG, CAT y mMRC, un grupo más alto de GOLD, y mayores ingresos de EPOC por año. Los pacientes con CES-D de ≥ 16 caminaron distancias más cortas. El cuartil más alto de BODE estuvo asociado con las puntuaciones peores de CRSG, CAT y CES-D.*

***Conclusión:*** *El grupo GOLD más alto y el cuartil más alto de BODE se asociaron con peores puntuaciones de calidad de vida y puntuaciones de depresión más altas. Los pacientes en los grupos de GOLD más altos deben ser tamizados para detectar si padecen depresión. La educación sobre la EPOC debe estar dirigida a aquellos que tienen una situación socioeconómica inferior.*


**Palabras clave:** Índice de BODE, enfermedad pulmonar obstructiva crónica, depresión, etnicidad, calidad de vida, situación socioeconómica

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## INTRODUCTION

According to the World Health Organization (WHO), 65 million people have moderate to severe chronic obstructive pulmonary disease (COPD) globally (1). The burden of disease in Trinidad and Tobago is thought to be significant, with the prevalence of obstructive airways disease in acute hospital admissions at about 21% and in four chronic disease clinics

also at about 21%, though there has been no published national study (2, 3).

Chronic obstructive pulmonary disease has been described as a multidimensional disease with multiple risk factors, systemic features, and co-morbidities. Risk factors include cigarette-smoking (1), occupational exposures, indoor air pollution (4), previous history of tuberculosis (5) and, importantly, low socio-economic status (SES) (6). However, COPD also has systemic consequences, such as malnutrition (low body mass index (BMI)) (7) which has been included in the multidimensional expression of COPD referred to as the body mass index, airflow obstruction, dyspnoea and exercise capacity (BODE) index (7) and a 'comorbidome' that is related to mortality. The common co-morbidities in COPD are diabetes mellitus, hypertension and depression (2, 3, 8). Depression is a major co-morbidity in COPD with a prevalence ranging from 7% to 42% (9). Symptoms of depression may be confused with symptoms of COPD and therefore go undiagnosed and untreated (9).

Little is known about the epidemiology of COPD in the West Indies. We studied 105 patients with COPD in the chest clinics of tertiary centres in Trinidad and Tobago to characterize their disease according to the quality of life, disease severity and BODE score.

## SUBJECTS AND METHODS

This is a cross-sectional, observational study of patients who attended the outpatient chest clinics at the Port-of-Spain General Hospital and the Eric Williams Medical Sciences Complex, Trinidad, between August 2011 and March 2013. Ethics approval was obtained from the ethics committees of the North West Regional Health Authority and the Faculty of Medical Sciences, The University of the West Indies, St Augustine, Trinidad and Tobago, West Indies.

Inclusion criteria: patients were recruited if they attended any of the chest clinics of the above institutions, were over 40 years of age and diagnosed with COPD, and gave written informed consent. Chronic obstructive pulmonary disease was defined as the presence of respiratory symptoms and a post-bronchodilator forced expiratory volume in one second (FEV1)/forced vital capacity (FVC) ratio of less than 0.7 (10).

Exclusion criteria: patients were excluded if they had received a blood transfusion, had a moderate to severe exacerbation of COPD (requiring corticosteroid, antibiotics or hospitalization) within the four weeks prior to the study (11), had suffered an acute myocardial infarction within three months before the study, had used antibiotics within two weeks before the study, were on long-term oral corticosteroid treatment (for at least eight weeks), were unable to walk, were unable to perform spirometry, or had any condition that would likely lead to suboptimal results on spirometry.

The COPD Assessment Test (CAT) and St George's Respiratory Questionnaire (SGRQ) were used to assess the impact of COPD on the patient's well-being and daily life (12, 13). An acute exacerbation of COPD (AECOPD) was taken as a change in respiratory symptoms requiring a course of oral corticosteroids and/or antibiotics (14). Frequent exacerbations were taken as two or more in the year before recruitment. Patients were asked about exposures (dust/fumes, biomass or indoor cooking in a wood oven) at home and at work, and as a child. An ever-smoker was defined as a person who admitted to smoking more than 100 cigarettes in his/her lifetime (15).

The six-minute walk test and Borg dyspnoea scale were used to assess functional capacity (16). The total distance walked in six minutes was taken as the six-minute walk distance (6MWD), and BODE index calculated.

To assess depressive symptoms in patients with COPD, the Center for Epidemiologic Studies Depression Scale (CES-D) was used, as most international work on COPD had utilized this scale (9). A CES-D of $\geq 16$ indicates severe depressive symptoms (9). Since this scale had not been validated in a Trinidadian population, two additional scales were used on a subset of patients: the modified Zung scale and the Patient Health Questionnaire-9 (PHQ-9) which were applied on a subset of patients ($n = 35$, the last 35 patients recruited) for comparison, as they had previously been validated for use in a Trinidadian population (17). The CES-D total score correlated highly with the Zung total score (Spearman's rho = 0.921) and PHQ-9 total score (Spearman's rho = 0.962), with $p < 0.001$ in both cases; thus, we present data for CES-D only.

Data were analysed using SPSS version 12 software, and the Kolmogorov-Smirnov test of normality was applied. Normally distributed data were expressed as mean (standard deviation (SD)) and skewed data as median (interquartile range). Pearson's correlation was used for normally distributed data, and the Spearman rank test was used to assess non-parametric correlations. Kendall's tau-b was used to evaluate the correlation of the Global Initiative for Chronic Obstructive Lung Disease (GOLD) group data with SGRQ, CAT score and CES-D. The Mann-Whitney U test was used for non-parametric variables.

## RESULTS

### Demographics and physiologic variables

Table 1 shows that 14 patients were excluded. Data from five patients were incomplete because two patients had died and three could not be contacted (wrong telephone numbers). Table 2 shows that the two major ethnic groups (Indo-Trinidadians and Afro-Trinidadians) were similar in proportion. Afro-Trinidadians had better SGRQ total and impact scores than non-Afro-Trinidadians ($p < 0.05$), and 26.7% of the patients had a BMI of < 21 kg/m$^2$. During the study period, five patients died; these patients were noted to have higher CAT scores (Spearman's rho = 0.209) and lower 6MWD (Spearman's rho = 0.229), with $p < 0.05$ in both instances.

Table 1: Exclusion criteria

| Exclusion criteria | Excluded patients (n = 14) |
|---|---|
| < 40 years old | 2 (14.3%) |
| Unable to walk | 8 (57.1%) |
| Refused to participate | 4 (28.6%) |

### Socio-economic status

This was assessed by the level of education and monthly household income. Patients who reported only primary level education had worse SGRQ total and impact scores ($p < 0.05$), increased dyspnoea (modified Medical Research Council (mMRC) scale of ≥ 2) ($p = 0.007$), lower FEV1 % predicted ($p < 0.05$) and higher BODE scores ($p < 0.05$), and were more likely to have at least one co-morbidity ($p < 0.05$). Lower monthly household income was associated with lower BMI (Spearman's rho = 0.202; $p < 0.05$).

### COPD severity and group

Table 3 shows that the majority of patients in this study were at GOLD stage 2. Higher GOLD stage was associated with lower BMI ($p = 0.007$). The Figure shows the distribution of patients by GOLD group. Higher GOLD group was associated with worse SGRQ total (Kendall tau = 0.545; $p < 0.05$), impact (Kendall tau = 0.519; $p < 0.05$), activity (Kendall tau = 0.479; $p < 0.05$) and symptom (Kendall tau = 0.445; $p < 0.05$) scores and worse CAT (Kendall tau = 0.529; p < 0.05) scores. Higher GOLD group was also associated with a worse CES-D score (Kendall tau = 0.446; $p < 0.05$). Table 4 shows the distribution of BODE index scores in this study. Table 5 shows that higher BODE quartile was associated with worse quality of life scores, CAT scores of more than 9 and higher CES-D depression scores ($p < 0.05$).

Table 2: Subject characteristics (n = 105)

| Parameter | |
|---|---|
| Age (years): mean (standard deviation (SD)) | 66.9 (9.6) |
| Gender, male: n (%) | 90 (85.7) |
| Body mass index (kg/m$^2$): median (interquartile range (IQR)) | 25.0 (20.3–29.4) |
| Ethnicity: n (%) | |
| Indo-Trinidadian | 39 (37.1) |
| Afro-Trinidadian | 45 (42.9) |
| Caucasian | 2 (1.9) |
| Mixed | 19 (18.1) |
| Monthly household income: n (%) | |
| < TT$5000 | 62 (59.0) |
| TT$5000–10 000 | 31 (29.5) |
| > TT$10 000 | 7 (6.7) |
| Missing | 5 (4.8) |
| Level of education: n (%) | |
| Primary | 68 (64.8) |
| Secondary | 24 (22.9) |
| Tertiary | 8 (7.6) |
| Missing | 5 (4.8) |
| Smoking history: n (%) | |
| Current smoker* | 29 (27.6) |
| Never-smoker | 10 (9.5) |
| Ex-smoker** | 60 (57.1) |
| Intermittent smoker | 6 (5.7) |
| Smoking pack-years: median (IQR) | 40.0 (18.0–58.3) |
| Lung function: mean (SD) | |
| Forced expiratory volume in one second (FEV1)/L | 1.51 (0.62) |
| FEV1 % predicted | 63.2 (22.9) |
| Forced vital capacity (FVC)/L | 2.62 (0.84) |
| FEV1/FVC % | 56.7 (10.7) |
| Acute exacerbation of chronic obstructive pulmonary disease (COPD): median (IQR) | 1.0 (0.0–2.0) |
| Center for Epidemiologic Studies Depression Scale ≥ 16: n (%) | 25 (23.8) |
| Modified Medical Research Council scale: median (IQR) | 2.0 (1.0–3.0) |
| Six-minute walk distance/m: mean (SD) | 295.96 (112.26) |
| COPD Assessment Test: median (IQR) | 15.0 (8.0–23.5) |
| St George Respiratory Questionnaire: mean (SD) | |
| Activity | 61.21 (29.78) |
| Impact | 31.30 (23.60) |
| Symptom | 44.28 (22.14) |
| Total | 42.55 (23.17) |
| Co-morbidities: n (%) | |
| Diabetes | 23 (22) |
| Hypertension | 30 (29) |
| Prior myocardial infarction | 16 (15) |
| Gastro-oesophageal reflux disease | 10 (10) |
| Hyperlipidaemia | 10 (10) |
| Heart failure | 10 (10) |
| *Acanthosis nigricans* | 10 (10) |

* Those who are still smoking or have quit within one year.
** Those who have quit smoking for more than one year.

## Exposures

Table 2 shows that 27.6% of the patients were current smokers. Twenty per cent used marijuana, 81.9% reported childhood exposure to indoor cooking (biomass exposure), 70.5% (74) passive smoke exposure, 80% (84) occupational exposures, and 42.9% (45) indoor air pollution. Female patients smoked fewer pack-years than male patients ($p < 0.05$). For the 10 never-smokers, exposures admitted to were biomass exposure (n = 8), passive smoking (n = 9), dust/fumes in the workplace (n = 9) and dust/fume exposure at home (n = 5).

## Other risk factors

Of the patients, 3.9% had old tuberculosis disease, 1% latent tuberculosis infection and 21.9% asthma. Patients

Table 3: Spirometric classification of the Global Initiative for Chronic Obstructive Lung Disease (GOLD) (n = 105)

| In patients with forced expiratory volume in one second (FEV1)/ forced vital capacity of < 0.7 (post-bronchodilator) | | | |
|---|---|---|---|
| **GOLD stage** | **Severity** | **FEV1 % predicted** | **n (%)** |
| GOLD 1 | Mild | FEV1 ≥ 80% | 23 (21.9) |
| GOLD 2 | Moderate | 50% ≤ FEV1 < 80% | 51 (48.6) |
| GOLD 3 | Severe | 30% ≤ FEV1 < 50% | 19 (18.1) |
| GOLD 4 | Very severe | FEV1 < 30% | 12 (11.4) |

Table 4: Body mass index, airflow obstruction, dyspnoea and exercise capacity (BODE) index scores and BODE quartiles

| BODE index score | n (%) | BODE quartile | n (%) |
|---|---|---|---|
| 0 | 18 (17.1) | | |
| 1 | 15 (14.3) | 1 | 46 (43.8) |
| 2 | 13 (12.4) | | |
| 3 | 4 (3.8) | 2 | 24 (22.9) |
| 4 | 20 (19) | | |
| 5 | 10 (9.5) | | |
| 6 | 8 (7.6) | 3 | 18 (17.1) |
| 7 | 5 (4.8) | | |
| 8 | 8 (7.6) | | |
| 9 | 4 (3.8) | 4 | 17 (16.2) |
| 10 | 0 (0) | | |

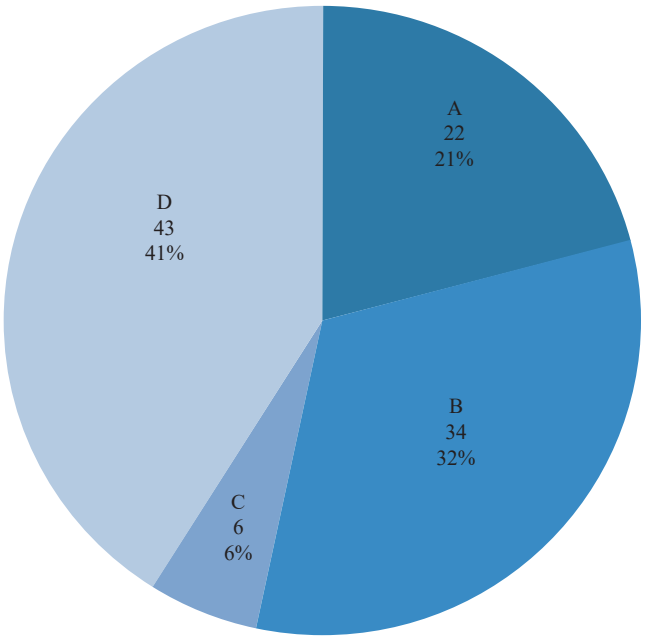


Figure: Global Initiative for Chronic Obstructive Lung Disease (GOLD) – GOLD group, n, %.

Table 5: Correlations

| | 6MWD | mMRC ≥ 2 | CAT ≥ 10 | CES-D ≥ 16 | SGRQ – impact | SGRQ – activity | SGRQ – symptom | SGRQ – total | BODE quartile | AECOPD ≥ 2/year |
|---|---|---|---|---|---|---|---|---|---|---|
| Age | -0.421*** | | | | | | | | 0.196* | |
| FEV1% predicted | 0.402*** | -0.301** | -0.276** | | -0.293** | -0.333*** | | -0.329*** | -0.692*** | |
| 6MWD | | -0.435*** | -0.448*** | | -0.453*** | -0.516*** | -0.282** | -0.486*** | -0.699*** | |
| mMRC ≥ 2 | | | 0.581*** | 0.229** | 0.624*** | 0.722*** | 0.336*** | 0.678*** | 0.624*** | |
| CAT ≥ 10 | | | | 0.485*** | 0.836*** | 0.735*** | 0.726*** | 0.848*** | 0.509*** | 0.365*** |
| CES-D ≥ 16 | | | | | 0.438*** | 0.338*** | 0.404*** | 0.428*** | 0.256** | 0.514*** |
| SGRQ – impact | | | | | | 0.816*** | 0.711*** | 0.963*** | 0.576*** | 0.428*** |
| SGRQ – activity | | | | | | | 0.570*** | 0.920*** | 0.618*** | 0.295** |
| SGRQ – symptom | | | | | | | | 0.757*** | 0.334*** | 0.487*** |
| SGRQ – total | | | | | | | | | 0.609*** | 0.426*** |

* Correlation is significant at the 0.05 level (two-tailed).
** Correlation is significant at the 0.01 level (two-tailed).
*** Correlation is significant at the 0.001 level (two-tailed).
6MWD: six-minute walk distance. mMRC: modified Medical Research Council scale. CAT: chronic obstructive pulmonary disease (COPD) assessment test. CES-D: Center for Epidemiologic Studies Depression Scale. SGRQ: St George Respiratory Questionnaire. BODE: body mass index, airflow obstruction, dyspnoea and exercise capacity. AECOPD: acute exacerbation of COPD. FEV1: forced expiratory volume in one second.

with COPD who also had a history of asthma had more chest infections per year (Spearman's rho = 0.226) and hospital admissions per year (Spearman's rho = 0.225). Older age was associated with lower FEV1 (r = 0.371) and lower FVC (r = 0.390).

**Co-morbidities**

Table 2 shows that most patients had either diabetes or hypertension. Thirty-seven (35.2%) patients had one comorbid condition, 13 (12.4%) had two and 10 (9.5%) had three or more co-morbidities. The mean number of chest infections per year was higher for patients with gastro-oesophageal reflux disease (GERD) (mean = 6.3) than for those without GERD (mean = 1.3).

**Depression scores**

The mean (SD) CES-D depression score was 9.45 (11.7). Of the patients with COPD, 25% had a CES-D of ≥ 16, indicating the presence of severe depressive symptoms. Higher CES-D scores were associated with shorter 6MWD (Spearman's rho = 0.379), higher post-walk Borg fatigue (Spearman's rho = 0.480), higher post-walk dyspnoea score (Spearman's rho = 0.428). A CES-D of ≥ 16 was associated with higher GOLD group (Spearman's rho = 0.549) and increased admissions for COPD in the past year (Spearman's rho = 0.326). Table 5 shows the relationships with worse SGRQ and CAT scores, higher mMRC scores and more AECOPD ($p < 0.05$ in all cases).

## DISCUSSION

To our knowledge, this is the first study of patients with COPD in specialist care in the English-speaking Caribbean. We found a gender distribution in favour of males and that patients with a lower level of education were more likely to have findings consistent with severe COPD. On the other hand, higher GOLD group was associated with worse quality of life scores and higher depression scores.

While a minority of patients were female, they had fewer pack-years of smoking than males but no differences in COPD severity. Taken together with our previous study of in-hospital patients with COPD which found a majority of female patients with COPD (2), these data suggest that there may be gender bias in the diagnosis of COPD but also that these females may be more susceptible to the effects of cigarette smoke as found previously (4).

The majority of patients were of low SES as assessed by reported monthly household income and education level as such patients are more likely to attend the public sector clinics which are free at the point of delivery of care in this country. Patients having attained only primary level education had findings consistent with more severe disease compared to those who had attained secondary level education or higher, similar to a prior American study of insured patients with COPD (6). Low SES has been shown to be an independent risk factor for COPD severity status (18), but this may be because low SES is associated with increased exposures, smoking, infections, poor nutrition, tuberculosis and other risk factors for COPD (4–6).

Only 9.5% of patients in this study were never-smokers. In a previous study of patients with COPD in Trinidad and Tobago, 61% of patients denied cigarette use (2). These patients were sampled only from acute hospitalizations whereas our study took only patients with a doctor-diagnosed history of COPD. This may indicate that there was under-diagnosis of COPD in non-smokers or that COPD in such subjects was less severe. Analysis of data from 14 countries involved in the Burden of Obstructive Lung Disease study showed that 42.9% of persons with COPD were never-smokers (19).

In this study, we found that 22% of patients reported being asthmatic, and they were likely to have a history of frequent chest infection and hospital admission. Older age was associated with lower FEV1 and lower FVC. A higher degree of obstruction was seen in older age groups in keeping with a prior study done in Trinidad and Tobago (2). The prevalence of tuberculosis in the Trinidadian population was estimated at 0.26% by WHO (1). In our study, 3.9% of patients reported a history of old tuberculosis which was 150 times the prevalence expected for the general population. Both COPD and pulmonary tuberculosis have common risk factors such as smoking and low SES, and COPD has been found to be more common in patients diagnosed with tuberculosis (20).

In our study, 27% of patients were underweight which was three times the 9% prevalence found in a community study in north-central Trinidad (21) when a BMI of < 20 kg/m$^2$ was used as a definition for underweight. Thus, the proportion of underweight individuals with COPD was more than that in the general population. Studies have shown that low BMI is an independent predictor of increase in long-term mortality in patients with COPD and thus it is essential to address nutritional status in these patients because weight gain may improve prognosis (22).

Though the relationship between COPD and depression had been established in international studies (9),

the prevalence of depression in patients with COPD was not known for the Caribbean. We found that 25% of our patients with COPD had a CES-D of ≥ 16, indicating the presence of severe depressive symptoms. This prevalence was twice the 12.8% prevalence rate that was found in patients attending family practices in Trinidad (17). None of our patients with COPD had previously been diagnosed or treated for depression, but we found that depressive features were associated with worse health burden as typified by quality of life, lower BODE index and more exacerbations consistent with prior results (23).

In all, about one-third of patients had at least one comorbid condition, mainly diabetes and hypertension, but other common co-morbidities were: a history of previous myocardial infarction, heart failure, hypercholesterolaemia and GERD. Ten per cent of patients had *acanthosis nigricans*. The STEPs study showed the prevalence of diabetes in those > 35 years of age in Trinidad and Tobago to be 16% (24). In our study, 21.9% of patients gave a history of diabetes. A five-year follow-up of 1266 Japanese men found that an increased number of pack-years correlated with the development of impaired glucose tolerance and Type 2 diabetes (25).

Though the distribution of AECOPD per year was skewed, the mean number of exacerbations per year in patients with GERD was greater than those with no history of GERD. Previously, GERD had been associated with an increased rate of exacerbations (26). Micro-aspiration of gastric contents from gastro-oesophageal reflux may act as an airway irritant and exacerbate COPD. Further study is needed to determine if treatment of GERD will ameliorate the risk for AECOPD.

In a prior study, patients with COPD had worse quality of life than well persons (13). Our study further showed that depression was associated with worse quality of life scores in patients with COPD. Depression was also associated with other measures of impaired functionality: shorter 6MWD with worse post-Borg scores. Reduced exercise capacity may be associated with further isolation and therefore worsened depressive symptoms. A CES-D of ≥ 16 was associated with a history of frequent AECOPD, in keeping with findings from a study by Papaioannou *et al* (27).

In our study, we found for the first time that higher BODE index was associated with lower level of education which we had previously presented (28), and our results support previous findings by Prescott and Vestbo of a relation of socio-economic status to FEV1 in COPD (29). We also found that higher BODE quartile was associated with worse quality of life, CAT scores and higher CES-D depression score. The self-paced 6MWD (an independent predictor of mortality) assesses the submaximal level of functional capacity which is reflective of daily activity (16, 30). Six-minute walk distance assesses functional capacity and response to therapy (16). This test should be done on all patients with COPD.

This study has several limitations. The prevalence of restrictive lung diseases in this study was not known. During patient recruitment, this study focussed on outpatient chest clinics so the sample did not represent the general population or patients with COPD in the acute setting. Patients with mild COPD are often discharged from the hospital chest clinics to the community health centres for follow-up. Therefore, our study may have been biased towards patients with more severe COPD. Most subjects attending public health institutions in the Caribbean are of lower socio-economic standing; thus, our results may not be reflective of the population of Trinidad and Tobago as a whole.

## CONCLUSION

In conclusion, this study shows that the majority of patients with COPD in our tertiary chest clinics were male. Given that gender bias can occur, a high index of suspicion is warranted, especially for female patients. We recommend that COPD education (with more initiatives such as smoking cessation and adult vaccination programmes) should be targeted at patients with a lower level of education and our health facilities need to be focussed on the rising prevalence of COPD that will occur because of our ageing population (31). It is essential to identify patients at risk in order to improve nutritional status and thus prognosis. All patients with COPD in tertiary care should have their depression status checked. Patients with COPD should be assessed on admission to a chest clinic with a BODE score and 6MWD. There are clinical implications for comorbid diabetes and COPD, especially with the use of oral glucocorticoids to treat acute exacerbations.

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## REFERENCES


1. World Health Organization [Internet]. Chronic obstructive pulmonary disease (COPD); 2013 [cited 2013 Sep 13]. Available from: www.who.int/respiratory/copd/en.
2. Seemungal T, Harrinarine R, Rios M, Abiraj V, Ali A, Lacki N et al. Obstructive lung disease in acute medical patients. West Indian Med J 2008; **57:** 7–13.
3. Thorington P, Rios M, Avila G, Henry J, Haynes C, Pinto Pereira LM et al. Prevalence of chronic obstructive pulmonary disease among stable chronic disease subjects in primary care in Trinidad, West Indies. J Thorac Dis 2011; **3:** 177–82.
4. Jain NK, Thakkar MS, Jain N, Rohan KA, Sharma M. Chronic obstructive pulmonary disease: does gender really matter? Lung India 2011; **28:** 258–62.
5. Danielsson P, Ólafsdóttir IS, Benediktsdóttir B, Gíslason T, Janson C. The prevalence of chronic obstructive pulmonary disease in Uppsala, Sweden – the Burden of Obstructive Lung Disease (BOLD) study: cross-sectional population-based study. Clin Respir J 2012; **6:** 120–7.
6. Eisner MD, Blanc PD, Omachi TA, Yelin EH, Sidney S, Katz PP et al. Socioeconomic status, race and COPD health outcomes. J Epidemiol Community Health 2011; **65:** 26–34.
7. Celli BR, Cote CG, Marin JM, Casanova C, Montes de Oca M, Mendez RA et al. The body mass index, airflow obstruction, dyspnea, and exercise capacity index in chronic obstructive pulmonary disease. N Engl J Med 2004; **350:** 1005–12.
8. Chatila WM, Thomashow BM, Minai OA, Criner GJ, Make BJ. Comorbidities in chronic obstructive pulmonary disease. Proc Am Thorac Soc 2008; **5:** 549–55.
9. Quint JK, Baghai-Ravary R, Donaldson GC, Wedzicha JA. Relationship between depression and exacerbations in COPD. Eur Respir J 2008; **32:** 53–60.
10. Vestbo J, Hurd SS, Agusti AG, Jones PW, Vogelmeier C, Anzueto A et al. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease: GOLD executive summary. Am J Respir Crit Care Med 2013; **187:** 347–65.
11. Seemungal T, Donaldson GC, Paul EA, Bestall JC, Jeffries DJ, Wedzicha JA. Effect of exacerbation on quality of life in patients with chronic obstructive pulmonary disease. Am J Respir Crit Care Med 1998; **157:** 1418–22.
12. Dodd JW, Hogg L, Nolan J, Jefford H, Grant A, Lord VM et al. The COPD assessment test (CAT): response to pulmonary rehabilitation. A multicentre, prospective study. Thorax 2011; **66:** 425–9.
13. Seemungal TA, Lun JC, Davis G, Neblett C, Chinyepi N, Dookhan C et al. Plasma homocysteine is elevated in COPD patients and is related to COPD severity. Int J Chron Obstruct Pulmon Dis 2007; **2:** 313–21.
14. Seemungal T, Stockley R, Calverley P, Hagan G, Wedzicha JA. Investigating New Standards for Prophylaxis in Reduction of Exacerbations – The INSPIRE Study Methodology. COPD 2007; **4:** 177–83.
15. National Center for Health Statistics, Centers for Disease Control and Prevention, United States of America. National Health Interview Survey Adult Tobacco Use Information [Internet]. Atlanta, GA: Centers for Disease Control and Prevention; 2009 [updated 2009 Jun 17; cited 2013 Sep 14]. Available from: www.cdc.gov/nchs/nhis/tobacco/tobacco_glossary.htm.
16. ATS Committee on Proficiency Standards for Clinical Pulmonary Function Laboratories. ATS statement: guidelines for the six-minute walk test. Am J Respir Crit Care Med 2002; **166:** 111–7.
17. Maharaj RG, Reid SD, Misir A, Simeon DT. Depression and its associated factors among patients attending chronic disease clinics in southwest Trinidad. West Indian Med J 2005; **54:** 369–74.
18. Lange P, Marott JL, Vestbo J, Ingebrigtsen TS, Nordestgaard BG. Socioeconomic status and prognosis of COPD in Denmark. COPD 2014; **11:** 431–7.
19. Lamprecht B, McBurnie MA, Vollmer WM, Gudmundsson G, Welte T, Nizankowska-Mogilnicka E et al. COPD in never smokers: results from the population-based burden of obstructive lung disease study. Chest 2011; **139:** 752–63.
20. Inghammar M, Ekbom A, Engström G, Ljungberg B, Romanus V, Löfdahl CG et al. COPD and the risk of tuberculosis – a population-based cohort study. PLoS One 2010; **5:** e10138.
21. Gulliford MC, Mahabir D, Rocke B. Food insecurity, food choices, and body mass index in adults: nutrition transition in Trinidad and Tobago. Int J Epidemiol 2003; **32:** 508–16.
22. Schols AM, Slangen J, Volovics L, Wouters EF. Weight loss is a reversible factor in the prognosis of chronic obstructive pulmonary disease. Am J Respir Crit Care Med 1998; **157:** 1791–7.
23. Fan VS, Ramsey SD, Giardino ND, Make BJ, Emery CF, Diaz PT et al. Sex, depression, and risk of hospitalization and mortality in chronic obstructive pulmonary disease. Arch Intern Med 2007; **167:** 2345–53.
24. Pan American Health Organization [Internet]. Pan American STEPs chronic non-communicable disease risk factor survey – final report (Trinidad and Tobago); 2012 [updated 2012 Feb; cited 2013 Sep 15]. Available from: www.who.int/ncds/surveillance/steps/TrinidadAndTobago_2011_STEPS_Report.pdf.
25. Nakanishi N, Nakamura K, Matsuo Y, Suzuki K, Tatara K. Cigarette smoking and risk for impaired fasting glucose and type 2 diabetes in middle-aged Japanese men. Ann Intern Med 2000; **133:** 183–91.
26. Hurst JR, Vestbo J, Anzueto A, Locantore N, Müllerova H, Tal-Singer R et al. Susceptibility to exacerbation in chronic obstructive pulmonary disease. N Engl J Med 2010; **363:** 1128–38.
27. Papaioannou AI, Bartziokas K, Tsikrika S, Karakontaki F, Kastanakis E, Banya W et al. The impact of depressive symptoms on recovery and outcome of hospitalised COPD exacerbations. Eur Respir J 2013; **41:** 815–23.
28. Seemungal TAR, Mohammed S, Mohammed H, Sakahamuri S, Pinto-Perreira L, Teelucksingh S et al. A lower level of education is related to disease severity and biomass exposure in West Indian subjects with COPD. Am J Respir Crit Care Med 2014; **189:** A2204.
29. Prescott E, Vestbo J. Socioeconomic status and chronic obstructive pulmonary disease. Thorax 1999; **54:** 737–41.
30. Polkey MI, Spruit MA, Edwards LD, Watkins ML, Pinto-Plata V, Vestbo J et al. Six-minute-walk test in chronic obstructive pulmonary disease: minimal clinically important difference for death or hospitalization. Am J Respir Crit Care Med 2013; **187:** 382–6.
31. Central Statistical Office, Trinidad and Tobago [Internet]. Trinidad and Tobago 2011 Population and Housing Census Demographic Report; 2011 [cited 2013 Sep 15]. Available from: http://www.tt.undp.org/content/trinidad_tobago/en/home/library/crisis_prevention_and_recovery/publication_1.html.