

Original Research Article

A clinical study of pulmonary function tests in patients with COPD exacerbation

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ABSTRACT

Background: COPD is now recognized as an important cause of morbidity and mortality world over. This study aims to assess the serial change in spirometric values and 6-minute walking distance in COPD patients following exacerbation.

Methods: A prospective study of 40 patients who were admitted to St. Johns Medical College Hospital with Acute Exacerbation of COPD. After proper history, initial assessment and evaluation, appropriate treatment started according to standard hospital protocols. Spirometry and 6-minute walk distance (6MWD) was done at discharge and at an interval of two and six months during follow up. All the collected data was tabulated and statistically analysed by using software's SAS 9.2, SPSS 15.0.

Results: Among the 40 patients studied, there was a 9.18% drop in FVC (from 2.83 litres to 2.57 litres), 13.26% change in the FEV1/FVC ratio with a mean drop of 150 ml in FEV1 (1.5 litres to 1.35 litres) and 25 meters decline of 6MWD from 391.45 to 366.63 over 6 months follow up period, although none of them were statistically significant.

Conclusions: A drop in FEV1 and (6MWD) minute walk distance was found in our study population over 6 months follow period after COPD exacerbations which is in line with the various study reports available in the literature reinforcing the fact that patients with increased airway inflammation show faster decline in FEV1.

Keywords: COPD, Exacerbation, Pulmonary function, Spirometry

INTRODUCTION

COPD is now recognized as a worthy cause for morbidity and mortality in the world, globally, by 2020 COPD is expected to rise to 3rd position as the cause of death and 5th position as a cause of disability adjusted life years (DALY'S) according to the base line projections made in Global Burden of Disease Study (GBDS).¹ COPD is a major cause of health care burden worldwide and the only leading cause of death that is increasing in prevalence. The most common cause for exacerbation is

infection. These infective episodes may be due to bacterial, viral and rarely fungal infections, these exacerbation episodes accelerate lung function decline and considerably increases the morbidity, mortality and healthcare costs, some patients are prone to frequent exacerbations and these patients have worse health status, greater limitation of their daily activities, and faster disease progression.² In the West smoking is the most important etiological agent; the largest increase in tobacco related mortality is estimated to occur in India, China and other Asian countries, particularly in women

who are not smokers, indoor air pollution is a significant contributory factor. Important aspect in COPD epidemiology is the role of risk factors such as the tobacco smoking, biomass fuel combustion and other environmental exposures. India, tobacco smoking was reported to be responsible for over 41% of COPD.³

METHODS

A prospective study of a cohort of 40 patients hospitalized for AECOPD was undertaken to progressive changes in spirometric values over two and six months in comparison to values at discharge. Following Institutional ethical committee approval, informed written consent was taken from patients or attenders (where applicable) for enrolling in our study. The Study Inclusion criteria included: Patients diagnosed as COPD (GOLD guidelines) with FEV1/FVC <70% and no significant reversibility after inhaled bronchodilators who attended the St. John’s hospital OPD and Emergency from January 2012 to October 2012; age 40 to 85 years; Patients in acute exacerbation. Exclusion Criteria: Patients suffering from other Obstructive lung disease like Bronchial asthma and airway diseases like Bronchiectasis and interstitial lung diseases; Patients suffering from other chronic inflammatory diseases like

Tuberculosis, leprosy, sarcoidosis, Collagen vascular/Connective tissue diseases eg. Rheumatoid arthritis; Patients suffering from acute coronary event in the last 3 weeks.

After proper history, initial assessment and evaluation with relevant investigations, appropriate treatment was started and managed appropriately. At the time of discharge spirometry (both pre-and post-bronchodilators by using asthalin inhaler with or without spacer) and (6MWD) minute walk tests were done. Patients were discharged with disease stage specific treatment protocols and were asked for follow up visits after two and six months. At each follow up visit patient underwent spirometric test and (6MWD) minute walk test at 6 months along with other relevant investigations and treatment modifications as required. All the collected data was tabulated and statistically analyzed by using software’s SAS 9.2, SPSS 15.0.

RESULTS

In our study population of 40 patients, mean age was 63.46 ± 7.67 years and ranged between 50 to 84 years, 77% of them were males and similar numbers came for rural background.

Table 1: The comparison of lung function tests between cases and controls.

Characteristic	Mean ± standard deviation			% change at 6 th month	P value
	At discharge	2 nd month	6 th month		
Fvc	2.83±0.29	2.7±0.3	2.57±0.32	9.18%	0.456
FEV1	1.50±0.19	1.41±0.18	1.35±0.18	10.00%	0.029
Fev1/fvc	53.59±5.80	50.59±5.66	46.48±6.22	13.26%	0.411

70% of our patients were smokers out of which nearly three fourth were current smokers and 20% had history of biomass fuel exposure.

However, in terms of duration of COPD there was equal distribution of less than or more than 10 years of illness.

Half of our patients came from agricultural background, a quarter of them were business men and rests were home makers. Among the study population there was a 9.18% drop in FVC (from 2.83-2.57litres), although this was not statistically significant.

There was a mean drop of 150ml FEV1 over 6months period (1.5-1.35litres), Similarly there was significant change in the FEV1/FVC ratio of 13.26%.

A progressive decline of (6MWD) minute walking distance was also noticed which dropped from 391.45 to 366.63 (25mts) over this period.

Table 2: Comparison of 6 min walk test at discharge and at 6 months.

6 min walk test	At discharge	At 6 months
Average walk distance	391.45	366.63

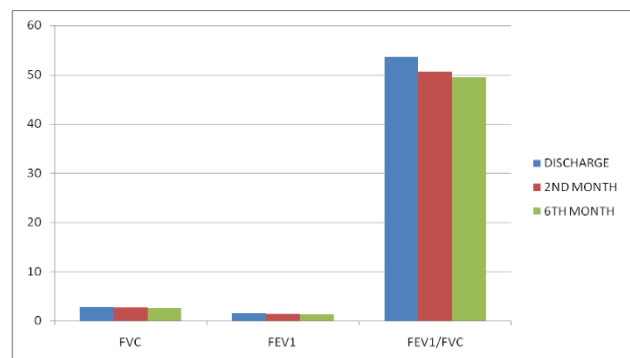


Figure 1: the comparison of lung function tests of cases at discharge, 2 months and 6 months.

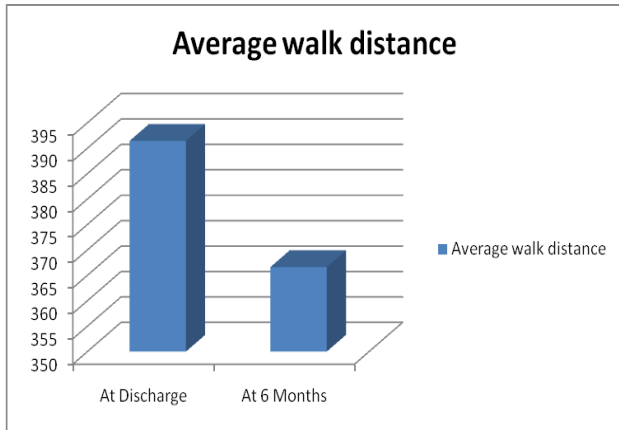


Figure 2: Comparison of 6 min walk test at discharge and at 6 months.

Table 3: The baseline demographic data of cases and controls.

Characteristic	Cases
Age (years)	63.46 ± 7.67
Gender	Male 31(77.5%)
	Female 9 (22.5%)
Urban/rural	Urban 9 (22.5%)
	Rural 31 (77.5%)
Occupation distribution	Agriculture 23(57.5%)
	Business 8(20.0%)
	Housewife 9(22.5%)
Smoking	Yes 29 (72.5%)
	No 11(27.5%)
Current smokers	Yes 28(70.0%)
	No 12(30.0%)
Bio-mass exposure	Yes 9(22.5%)
	No 31 (77.5%)
BMI (body mass index) kg/m ²	17.58±3.22
Duration of COPD	< 10 years 21(52.5%)
	>10 years 19(47.5%)

DISCUSSION

More severe exacerbations are associated with increased airway and systemic inflammation; Patients with increased airway inflammation show faster FEV1 decline; this explains disease progression due to severity of exacerbation.⁴ On review of literature Jadwiga A et al states that patients who suffered infrequent exacerbations <2 in the previous year had less drop in the FEV1 compared to the patients who suffered frequent exacerbations (3-8 in the previous year). Celli et al found that FEV1 percent decreased by 16%; the MMRC dyspnea scale score increased by 0.47U, one year following the exacerbation.⁶

Compared with single exacerbators, frequent exacerbators had a larger deterioration in BODE index at two years of follow-up.⁷ Wedzicha JA et al shown that

Contribution of exacerbation to lung function decline was of the order of 25% which are similar to the findings in our study.⁸

A fall in (6MWD) minute walking distance from 391.45 to 366.63 (25mts) over 6 months follow up period was less compared to study by Celli, et al who found that the 6MWD declined by 72m, one year following the exacerbation and it was more in frequent exacerbators in 2years follow up study.⁷

However, our study had a limitation of smaller sample size and a shorter duration of follow up period making it impossible to compare changes in spirometric values and 6-minute walk test results among frequent and infrequent exacerbators hence cannot be generalized to entire COPD population at large. A further study with larger cohort with prolonged follow up is the need of the hour.

CONCLUSION

A drop in FEV1 and (6MWD) minute walk distance was found in our study population after COPD exacerbations over 6 months follow up which is in line with the various study reports available in the literature further reinforcing the fact that exacerbations are associated with increased airway and systemic inflammation and patients with increased airway inflammation show faster FEV1 decline.

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Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

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