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Original Research Article

A study of correlation between prevalence of pulmonary artery hypertension with severity of bronchiectasis

Sachin Vidyasagar, Natesh Ganesan*, Gangadharan Vadivelu

Department of Respiratory Medicine, Saveetha Medical College, Chennai, Tamil Nadu, India

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***Correspondence:**
Dr. Natesh Ganesan,
E-mail: vikramnatesh123@gmail.com

ABSTRACT

Background: Pulmonary artery hypertension (PAH) dreadful complication in bronchiectasis. The 6th world symposium on pulmonary hypertension have taken mPAP of 20 mmHg as normal. Not much studies have been done based on the current cut off values, so we have incorporated values based on the new guidelines and made following observations.
Methods: This study was designed as an observational cross-sectional study consisting of 27 patients, who were admitted in Pulmonary medicine department.
Results: Out of 27 study subjects 15 were female's and 12 were males. It was found that 70.3% had less than 5 segments involved and 29.6% had more than 5 segments involved. Mean value of PAH was 34.48±18.06 mmHg. Analysis showed a significant correlation (r=0.67) between number of segments involved and incidence of pulmonary hypertension.
Conclusions: It is essential to evaluate the cardiac status of bronchiectasis patients at the time of diagnosis as cardiac manifestations are one of the dreadful complications.

Keywords: Chronic lung diseases, PAH, Cardiac evaluation

INTRODUCTION

Pulmonary artery hypertension (PAH) frequently complicates the course of various forms of chronic lung disease (CLD). Group 3 PH patients have the worst long-term survival of all the PH groups.[1] One such common CLD is Bronchiectasis which is a heterogeneous condition with a large number of predisposing factors. It is associated with many common and rare diseases which impact mucociliary clearance and immunity and is one of the most prevalent morbidities that leads to recurrent lower respiratory tract infections in any community. Due to different cut-off value for PAH taken in various studies and the difference in the population characteristics of study subjects, the prevalence estimates of PAH among CLDs like bronchiectasis is less clear. In our study we have taken the values based on 6th world symposium on pulmonary hypertension in 2018, where the conference has taken values based on recent data from normal subjects, showing that normal mPAP was 14.0±3.3 mmHg. Two standard deviations above this mean were taken as the cut off value, which would suggest mPAP >20 mmHg as above the upper limit of normal.[2] Not much studies have been done based on the current cut off values. In our study we have incorporated values based on the new guidelines and the following observations were made.

METHODS

This study was designed as observational cross-sectional study. All the participants were informed of its objectives before the study and a signed letter of consent was obtained. Our study cohort consisted of 27 patients, who were admitted. The study was done in Saveetha medical college hospital, Thandalam Chennai from 2020 to 2021.

Inclusion criteria

Patients who came with chronic lung disease and did not meet the exclusion criteria were included in the study.

Exclusion criteria

Patients who had the following were not included in the study, chest deformities, poor echo window, pericardial effusion on transthoracic echocardiography, active PTB, obstructive sleep apnea, pregnancy, critically ill patients in the ICU were excluded from the study.

All study who fulfilled the criteria underwent detailed history, clinical examination, BMI, PFT, chest radiography, HRCT, ECG and transthoracic echocardiography. Detailed 2D ECHO assessment was done for all study subjects using Vivid T8 ECH unit and 3. Mhz transducer according to the guidelines of American Society of Echocardiography by experienced cardiologist in the left lateral position. Assessment of degree of airflow limitation was evaluated by spirometry and the six minutes' walk test among all patients based on the ATS guidelines.

Statistical analysis was performed using R software version 4.1.1. Results were expressed as mean ± S.D. Qualitative data were tabulated in frequencies and percentages. Quantitative data were given in mean and standard deviation. Correlation between PH and number of segments involved among Bronchiectasis patients was analyzed using Pearson chi-squared test and a $p<0.05$ was considered to be significant. The important findings in our study were as follows

RESULTS

Out of 27 study subjects 15 were female's and 12 were males. The age of the study subjects ranged from 37-75 years. The mean BMI was 22±3.1 kg/m^2. Seven of the study subjects had comorbidity like diabetes or hypertension. The mean post bronchodilator FEV1 (%) was 43.44±13.

On 6 minutes' walk test, the distance walked ranged from 100m to 420m with a mean value of 299.35±73.5 without drop in oxygen saturation. Number of lung segments involved among all 27 study subjects were identified using HRCT. It was found that 19 of them (70.3%) had less than 5 segments involved and 8 of them (29.6%) had more than 5 segments involved (Figure 1).

On echo cardiography it was found that 15 study subjects had PAH. PAH ranged from 17 mmHg to 67 mmHg, with a mean value of 35.18±18.06 mmHg. In addition to PAH other parameters like fractional area change (FAC), right atrial sphericity index and TAPSE were assessed and found to have mean values of 35.14%±2.9%, 0.88±0.1, 20.8±3.6 mm respectively. Later correlation between number of segments involved in bronchiectasis and presence of PAH was analyzed and it was found that there is significant correlation (r=0.67) between HRCT involvement with incidence of pulmonary hypertension with $p<0.5$.

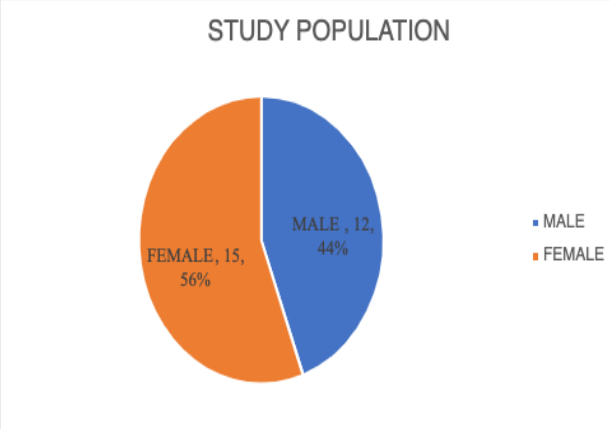

Figure 1: Sex ratio of demographic population.

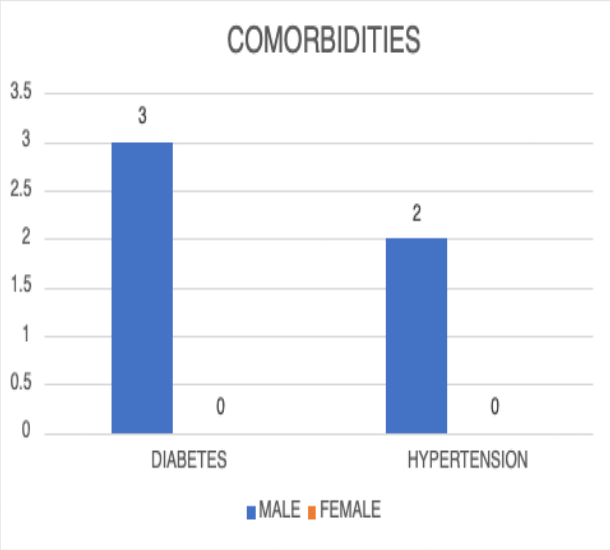

Figure 2: Study population and comorbidities.

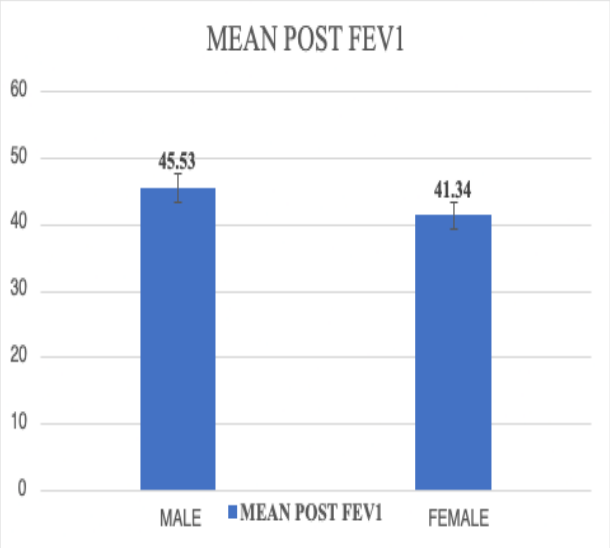

Figure 3: Mean post-FEV1 aming the study population.

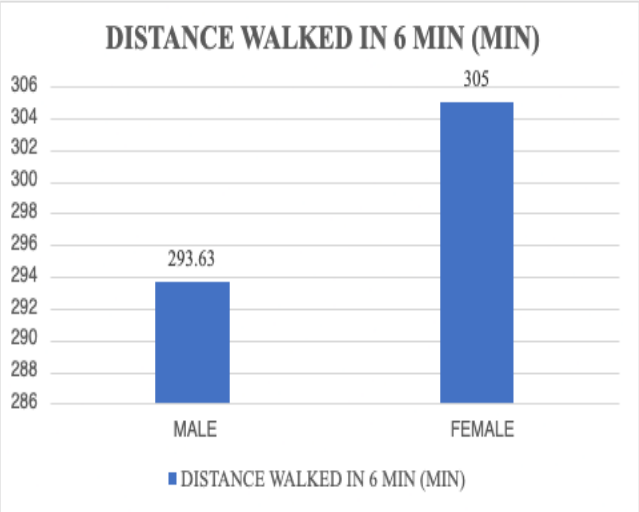

Figure 4: The mean distance covered in 6 minutes in male versus female population.

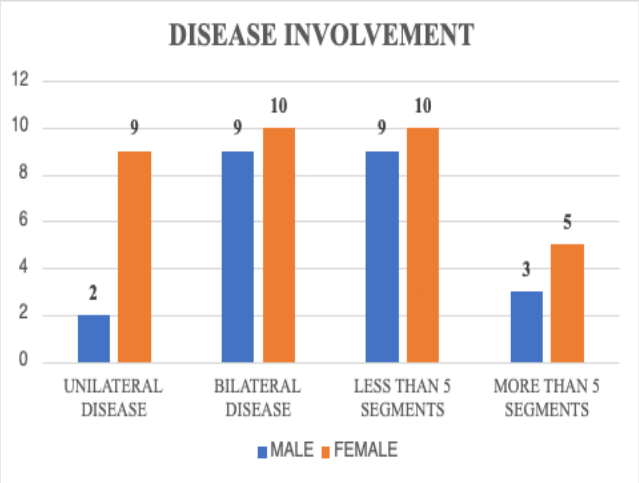

Figure 5: Disease involvement among the demographic population.

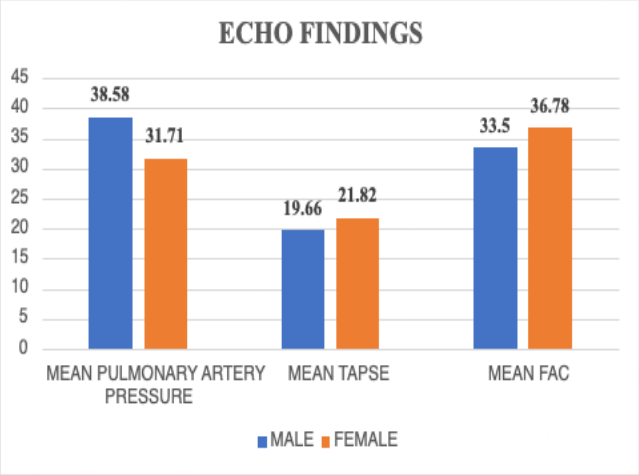

Figure 6: Mean echo findings (pulmoanry artery pressure, TAPSE and FAC) among the study population.

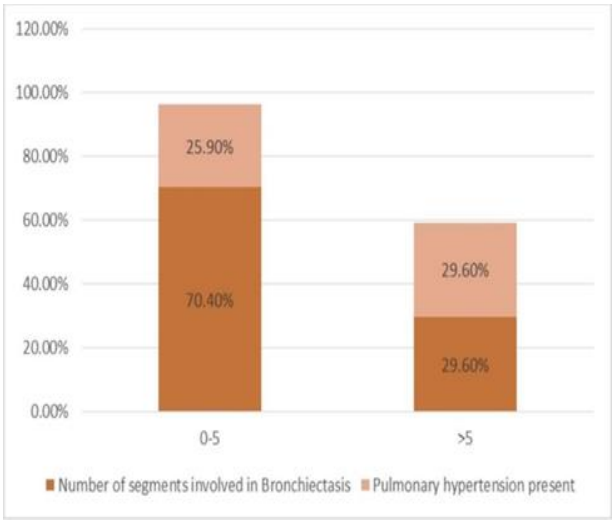

Figure 7: Correlation between number of segments involved in bronchiectasis and pulmonary hypertension.

DISCUSSION

Bronchiectasis is a heterogeneous condition with a long clinical history and many predisposing factors. HRCT has become the investigation of choice in bronchiectasis. Bronchial dilatation, and bronchial wall thickening is diagnostic off bronchiectasis.[3] Due to chronic hypoxia and destruction of the vascular bed in lung parenchyma pulmonary hypertension frequently complicates bronchiectasis.[4]

A total of 27 study subjects who fulfilled the inclusion criteria were recruited in our study after obtaining informed consent. All the study subjects have initially undergone detailed history taking and thorough clinical examination. Most of the study subjects presented with complaints of shortness of breath and 5 of them were smokers. All the study subjects were subjected for HRCT and number of segments effected was identified and divided in to <5 and >5 respectively. It was found that 19 of them (70.3%) had less than 5 segments involved and 8 of them (29.6%) had more than 5 segments involved. It is widely used to measure of functional status, as well as a predictor of prognosis.[5] With the clinical application suggested that simple measurement reflected on the pulmonary and functional status of patients with bronchiectasis, evaluation of the 6-minute walk test in population has been limited.

A study done by Lee at al clinical determinants of the 6-minute walk test in bronchiectasis provides a valuable information of the functional status in a group of patients with mild to moderate bronchiectasis and also indicates dynamic hyperinflation and increased work of breathing are responsible of disease.[5,6] Later all were subjected for echocardiography and was found that subjects who had more than 5 segments involved all of them had pulmonary hypertension. The mean pulmonary artery pressure was

34.48±18.06 mmHg, with lowest value of PAH of 17 mmHg and highest PAH of 67 mmHg. On analyzing this study, it was found that there is a significant correlation (r=0.67) between number of segments involved and incidence of pulmonary hypertension. As the number of segments involved was more there was increased incidence of pulmonary hypertension with p<0.5, which was statistically significant. This was similar to Devaraj et al, in his study, compared CT findings with pulmonary hypertension and concluded that it showed a highly prognostic indicator in evaluation of patients with bronchiectasis.[7] A study done by Alhamad et al also concluded similarly.[8]

Limitations of our study include a small study sample, non-equal study population, non-inclusion of other lung diseases which would cause a traction bronchiectasis changes.

CONCLUSION

Among the extra-pulmonary systemic comorbidities, cardiac manifestations are one of the most common complications. Cardiovascular disease is the major cause of morbidity and mortality in chronic lung diseases. It is essential to evaluate the cardiac status of such patients at the time of diagnosis. The need for recommendations regarding long term follow up of these patients and interventions to prevent them progress to pulmonary hypertension should be taken at the earliest. Therefore, it is desirable to develop useful and reliable tools to obtain an early diagnosis and to monitor and follow-up this condition, while new insights in the therapeutic approach are explored. The overall survival and quality of life can be improved by addressing this comorbidity.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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