Original Article

Hypertension and RV Dysfunction in Bronchiectasis

Pulmonary Hypertension and Right Ventricular Dysfunction; An insight in the Magnitude of Problem among Patients of Bronchiectasis

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ABSTRACT

Objective: To determine the frequency of pulmonary hypertension and Right Ventricular Dysfunction in diagnosed cases of bronchiectasis by Doppler Echocardiography.
Study Design: Cross sectional study
Place and Duration of Study: This study was conducted at the Department of Pulmonology, Jinnah Hospital, Lahore from September 2013 to March 2014.
Materials and Methods: After taking an informed consent, 120 patients with HRCT diagnosis of bronchiectasis were included through consecutive sampling. Pulmonary Hypertension (a mean pulmonary artery pressure > 25 mm Hg) and Right Ventricular Dysfunction (Systolic excursion of tricuspid annulus of < 2cm) was labeled using Doppler Echocardiography. Data was collected using a predesigned proforma and analyzed using SPSS version 21.
Results: It was seen that 75 patients (72.5%) were male 45 (37.5%) were female. Right ventricular dysfunction was present in 19 (15.8%) individuals while pulmonary hypertension was found in 47 individuals (39.2%).
Conclusion: It is concluded that a considerable proportion of patients suffer Right ventricular dysfunction while the frequency of pulmonary hypertension is significantly high in patients with bronchiectasis.
Key Words: Bronchiectasis, Pulmonary Hypertension,Right Ventricular Dysfunction, Echocardiography

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INTRODUCTION

First described by Rene Theophile Laënnec in 1819, bronchiectasis (BX) is now defined as permanently dilated airways due to chronic bronchial inflammation caused by inappropriate clearance of various microorganisms and recurrent or chronic infection.[1,2]. Induction of bronchiectasis requires two factors: an infectious insult and Impaired drainage, airway obstruction, or a defect in host defense. The ensuing host response causes a transmural inflammation, mucosal edema, cratering, ulceration, and neovascularization in the airways resulting in permanent abnormal dilatation and destruction of the major bronchi and bronchiole walls.[3]

There are numerous etiologies that can induce or contribute to the pathophysiologic processes that result in bronchiectasis and their frequency varies with the geographic location and referral population.

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Airway obstruction can be caused by foreign body aspiration, an intraluminal obstructing lesion such as a carcinoid tumor, or extra luminal compression from encroaching lymph nodes.[4]It is important to identify the presence of airway obstruction because surgical resection is often curative.

The classic clinical manifestations of bronchiectasis are cough and the daily production of mucopurulent and tenacious sputum lasting months to years and is occasionally associated with hemoptysis.[5,6] Dyspnea, rhinosinusitis, hemoptysis and recurrent pleurisy along with crackles and wheezing are also common findings in patients of bronchiectasis.[7]

Diagnosing BX has become significantly easier with the advent of high resolution computed tomography (HRCT), which has proved to be highly sensitive for demonstrating bronchiectatic change in the airways along with giving information on the distribution of bronchiectasis which may be important diagnostically. [8-10]

Since infection plays a major role in causing and perpetuating bronchiectasis, antibiotics are used to treat an acute exacerbation Other treatment modalities include inhaled bronchodilators, chest physiotherapy and pulmonary rehabilitation along with newer agent under trial like aerosolized antibiotic and recombinant DNase I.[11,12] Surgical intervention is often combined with an aggressive antibiotic and bronchial hygiene

regimen to reduce bacterial infection and allow better drainage. [13]

Mortality is high because of recurrent infections and cardiac complications. Common cardiac issues are pulmonary arterial hypertension (PAH), Right ventricular (RV) dysfunction and left ventricular (LV) diastolic dysfunction. Pulmonary arterial hypertension (PAH) is a progressive disease defined by chronic elevation in the pulmonary arterial pressure, often leading to right heart failure and death.[14]Diagnostic testing is indicated whenever PH is suspected using echocardiogram. When the echocardiogram does not suggest PH, right heart catheterization should be considered if the clinical suspicion for PH is high. [15] it is certainly much more prevalent than reported in developing countries.[16] Right ventricular systolic dysfunction is usually under diagnosed in bronchiectatic patients until full blown. In a small study of Saudi population right ventricular (RV) dysfunction came out about 12.8% (12/92) and pulmonary artery hypertension in 32.9% (31/94).[17] The electrocardiogram (ECG) of a patient with PH may demonstrate signs of right ventricular hypertrophy or strain but it is not sensitive for the detection of right ventricular disease. ECG changes do not correlate with disease severity or prognosis.[18] Echocardiography is performed to estimate the pulmonary artery systolic pressure and to assess right ventricular size, thickness, and function. In addition, echocardiography can evaluate right atrial size, left ventricular systolic and diastolic function, and valve function, while detecting pericardial effusions and intracardiac shunts.[19] It is also seen that PH is associated with worse survival in COPD, but does not influence the prognosis after lung transplantation.[20]

Bronchiectasis is an underdiagnosed disease in Pakistani population but not at least less prevalent. Cardiac complications symptomatically appear late but early diagnosis of cardiac dysfunctions will help apply some intervention which may halt the disease progression. Thus this study was designed to help delineate local patterns of pulmonary hypertension and cardiac complications in bronchiectasis patients which may aid to develop some consensus for screening of every bronchiectasis patient for cardiac issues early in the course of disease. A knowledge regarding disease burden of these cardiac issues may thereby also assist in formulation of local evidence based guidelines.

MATERIALS AND METHODS

This cross-sectional study was conducted in department of pulmonology in Jinnah Hospital, Lahore from January 2016 to June 2016. A total number of 120 patients aged 15 to 70 years, who were diagnosed as cases of bronchiectasis by HRCT were taken using non-probability consecutive sampling. Patients with a history of hypertension, valvular or rheumatic heart disease, ischemic heart disease, or cardiomyopathy; previous history of resection lung surgery, fibrosis, auto-immune diseases, interstitial lung disease and those on drugs for pulmonary hypertension were excluded from the study.

Patients selected were evaluated by Doppler Echocardiography for diagnosis of Right ventricular (RV) systolic dysfunction and pulmonary arterial hypertension. Pulmonary hypertension was defined by a pulmonary artery systolic pressure > 40 mm Hg measured by Doppler Echocardiography. RV systolic function was assessed by measuring the systolic excursion of the tricuspid annulus. Systolic excursion of tricuspid annulus of < 2cm was considered as right ventricular dysfunction. They were further treated according to standardized medical protocols. Data was collected on a structured proforma and SPSS version 17 was used for data analysis. Descriptive statistics were calculated for all quantitative variables like age, systolic excursion of the tricuspid annulus and Pulmonary Artery pressure as mean $\pm$ standard deviation and qualitative variables like sex, presence of RV Dysfunction and Pulmonary arterial hypertension as percentages and frequencies.

RESULTS

The results of the study showed mean age of patients 56.9 $\pm$ 5.47 with 75 patients (72.5%) were male 45 (37.5%) were female. Right ventricular dysfunction was present in 19 (15.8%) individuals while it was absent in 101 (84.2%)**.** Pulmonary hypertension according to operational definition was found in 47 individuals (39.2%) and it was not present in 73 (60.8%) individuals (Table 1).

Table No.I: frequency distribution of pulmonary hypertension and RV dysfunction (n=120)

Cardiac complication	Frequency	%
RV dysfunction	19	15.8%
Pulmonary hypertension	47	39.2%

Table No.2: stratification of age and sex with RV dysfunction

		RV dysfunction		Total	P value (using chi square)
		Yes	No		
Sex	Male	12	63	75	0.949
	Female	7	38	45	
Total		19	101	120	
Age group	Less than 50 Years	11	1	12	0.579
	51 to 60 Years	68	15	83	
	More than 60 Years	22	3	25	
Total		101	19	120	

When cross tabulation was done between the right ventricular dysfunction and gender, there came out a

non-significant difference (P value = 0.94) (Table II). Similarly, When age was cross tabulated across patients with right ventricular dysfunction, there was a non-significant difference i.e. age was not found associated with presence of right ventricular dysfunction. (p value= 0.579). (Table 2)

Pulmonary hypertension was equally distributed among both male and female (p value = 0.16). Similarly age was equally distributed for both groups with and without pulmonary hypertension after application of chisquare test with a p value of 0.807 (Table 3).

Table No.3: stratification of age and sex with PH

		PH		Total	P value (using chi square)
		Yes	No		
Sex	Male	33	42	75	0.161
	Female	14	31	45	
Total		47	73	120	
Age group	Less than 50 Years	8	4	12	0.807
	51 to 60 Years	51	32	83	
	More than 60 Years	14	11	25	
Total		73	47	120	

DISCUSSION

Right Ventricular Dysfunction and pulmonary hypertension is a serious complication of bronchiectasis. This study was carried out to determine the effect of bronchiectasis in these patients regarding the Right Ventricular Dysfunction in pulmonary hypertension. In our sampled population Right ventricular dysfunction was found in almost 16% of the individuals which is quite high as compared to previously reported study which shows that a clinician should be sensitized to take into an account of Right ventricular dysfunction. Similarly pulmonary hypertension was very much high about 40% of the sampled population. These results are slightly higher than a study conducted in Saudi population in which about 12.8% of the patients suffered from RV dysfunction while 32.9% of the patients with bronchiectasis had pulmonary hypertension.[17] This variation migh be because of the less sample size taken in the Saudi study which decreases the external validity of that study.

Another finding of this study is that the mean age of the population was 57 years showing that it's a disease of old age ranging from 42 to 70 years. Moreover it was also seen that 62% individuals were male while 37% were female. This gives an indication of the male predominance of bronchiectasis which may be because of the presence of risk factor which are more commonly found in male population. However, on stratification of data for age and gender it was seen that pulmonary hypertension and RV dysfunction was independent of both and the results were statistically insignificant. This gives an indication that any age group or gender are equally prone to development of this complication and it is related solely with the disease process.

Pulmonary hypertension and RV dysfunction are chronic, debilitating condition and it affects the vasculature of lungs along with the heart muscles. It is associated with increased mortality along with poor prognosis in these patients.[20] An early diagnosis and control of these two condition may help in improved survival and better outcome in these patients. Limitation of our study was the measurement of pulmonary artery pressure through non-invasive technique. Further studies should be encouraged in this regard so that the exact pathophysiology can be understood and evidence based management can be done to decrease the morbidity and mortality in patients with bronciestasis..

CONCLUSION

It can be concluded from this study that a significant proportion of the patient with bronchiestasis has right ventricular dysfunction while the frequency of pulmonary hypertension is even higher. The screening of these conditions done by simple test like echocardiogram can lead to remarkable results in the outcome of the disease. Thus it should be encouraged in these patients at an earlier stage to get the benefit of lead time and improve the survival in patients with not-so-unusual bronchiectasis.

Author's Contribution:

Concept & Design of Study:	M. Irfan Malik
Drafting:	Hafiza Shafia Naz
Data Analysis:	M. Irfan Malik
Revisiting Critically:	Hafiza Shafia Naz
Final Approval of version:	M. Irfan Malik

Conflict of Interest: The study has no conflict of interest to declare by any author.

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