ORIGINAL ARTICLE

JIACM 2018; 19(3): 183-86

Assessment of Systolic and Diastolic Dysfunction in Patients of Tuberculosis and its Correlation with Pulmonary Function Tests

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Abstract

Tuberculosis is a challenging problem especially in developing countries like India. Most patients of tuberculosis have pulmonary involvement but extrapulmonary tuberculosis is also a common entity. Cardiac involvement in tuberculosis is a frequently missed but important aspect of the disease. Symptoms like breathlessness, palpitations, fatigue, chest pain, etc., may also be due to cardiac involvement and hence may not be relieved if the clinician only focuses on correcting the respiratory component. In this study we tried to ascertain the prevalence of systolic and diastolic dysfunction in patients of tuberculosis and correlate them with pulmonary function tests.

Key words: Tuberculosis, systolic dysfunction, diastolic dysfunction, pulmonary function tests.

Introduction

Tuberculosis (TB) is one of the oldest diseases known to affect humans and continues to be a major health problem in the world and more so in developing countries like India. Most commonly the lungs are involved in tuberculosis. Cardiovascular involvement occurs in 1 - 2% of the patients with pulmonary tuberculosis and usually affects the pericardium, but very rarely myocardium and valves are involved[1,2]. As the symptoms of both involvements have significant overlap, cardiac involvement is easily missed. In this study we aim to find out the incidence of systolic and diastolic dysfunction in patients of tuberculosis, so a better strategy could be formulated lessening the morbidity of patients and this important aspect of the disease is not missed. We also correlate them with pulmonary function abnormalities to look for any association between them.

Material and methods

This study was carried out in the PG Department of Medicine, SN Medical College, Agra from Jan 2016 to June 2017 on patients of pulmonary tuberculosis attending indoor and outdoor. Informed consent was taken from all the patients included in the study. It was a cross-sectional, observational study. 100 patients of sputum positive pulmonary tuberculosis were included in the study. Patients meeting any of the following criteria were excluded from the study: 1. Sputum negative pulmonary tuberculosis. 2. Known case of any chronic respiratory disease like bronchial asthma, COPD, bronchiectasis, etc. 3. Diabetic patients. 4. Hypertensive patients. 5. Pre-existing heart disease. A thorough and complete history and physical examination was done and patients were subjected to specific investigations, echocardiography and pulmonary function tests (PFT).

Results

Table I shows the age and gender-wise distribution of patients included in our study. Majority of the patients were young (21 - 40 years). 69 patients were male and 31 patients were female.

Table I: Age and gender-wise distribution of patients.

Age group	N	Male	Female
10 - 20 years	12	6	6
21 - 30 years	45	31	14
31 - 40 years	35	25	10
41 - 50 years	8	7	1
Total number of patients	100	69	31

Table II and Fig. 1 show the distribution of pattern of pulmonary function tests found in patients.

Obstructive pattern was seen in 48% patients, restrictive pattern was seen in 16% patients while mixed pattern was seen in 16% patients. The pulmonary function tests were normal in 20 patients. Thus, most of the patients had abnormal pulmonary functions, obstructive pattern being the most common.

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Table II: Distribution of patients according to pattern of PFT abnormality.

Age group	Pattern of pulmonary function test							
	Normal		Obstructive		Restrictive		Mixed	
	Number	%	Number	%	Number	%	Number	%
10 - 20 (N = 12)	1	8.33	5	41.66	5	41.66	0	0
21 - 30 (N = 45)	8	17.77	26	57.77	5	11.11	6	13.33
31 - 40 (N = 35)	10	28.57	14	40	5	14.28	7	20
41 - 50 (N = 08)	1	12.50	3	37.50	1	12.50	3	37.50
Total	20		48		16		16	

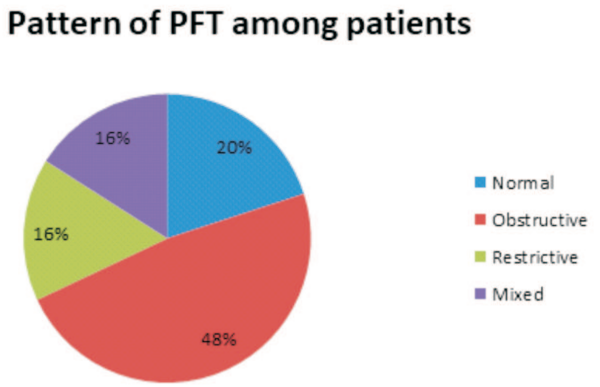

Fig. 1: *Showing pattern of PFT among patients.*

Table III and Fig. 2 show the distribution of systolic and diastolic dysfunction among the patients. Systolic dysfunction was seen in 8 out of 100 patients in the study while diastolic function was present in 12 out of 100 patients.

Table III: Showing distribution of systolic and diastolic dysfunction among patients.

Parameter	Normal	Abnormal
Systolic function	92	8
Diastolic function	88	12

Systolic dysfunction was seen in 8 out of 100 patients in the study. Systolic dysfunction was mild in 6 patients and moderate in 2 patients. None of the patients had severe left ventricular systolic dysfunction. 6 of the 8 patients having systolic dysfunction were females and 2 were males (Table IV).

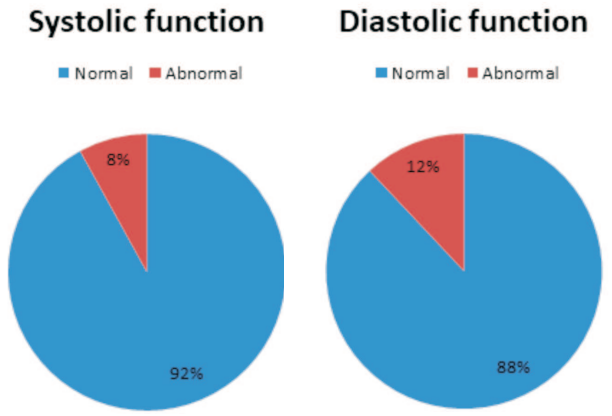

Fig. 2: *Showing distribution of systolic and diastolic dysfunction among the patients.*

Table IV: Distribution of systolic dysfunction among patients.

Sex	LVEF							
	Normal		Abnormal					
			Mild		Moderate		Severe	
	Number	%	Number	%	Number	%	Number	%
Male (N = 69)	67	97.10	2	2.89	0	0	0	0
Female (N = 31)	25	80.64	4	12.90	2	6.45	0	0
Total	92		6		2		0	

Table V: Distribution of diastolic dysfunction (E/A) ratio among patients.

Sex	Diastolic dysfunction (E/A ratio)									
	Normal		Grade 1		Grade 2		Grade 3		Grade 4	
	No.	%	Number	%	Number	%	Number	%	Number	%
Male (N = 69)	62	89.85	3	4.34	4	5.79	0	0	0	0
Female (N = 31)	26	83.87	2	6.45	1	3.22	2	6.45	0	0
Total	88		5		5		2		0	

Table V shows the distribution of diastolic dysfunction among patients. Diastolic dysfunction was seen in 12 out of 100 patients. 5 patients had grade 1 diastolic dysfunction, 5 had grade 2 diastolic dysfunction, and 2 patients had grade 3 diastolic dysfunction in our study.

Table VI shows the correlation between systolic and diastolic dysfunction among the patients having normal pulmonary function versus those having abnormal pulmonary function tests. Statistically significant association (p value < 0.05) was seen only in patients with mixed pattern pulmonary

function tests abnormality while the other patterns showed non-significant association.

Table VI: Showing correlation of systolic and diastolic dysfunction in patients having normal PFT with those having abnormal patterns on PFT.

	Normal PFT (N = 20)	Abnormal PFT (N = 80)		Obstructive Pattern (N = 48)		Restrictive Pattern (N = 16)		Mixed Pattern (N = 16)	
	%	%	p value	%	p value	%	p value	%	p value
Systolic dysfucntion	0	10	0.14	4.6	0.33	6.25	0.26	25	0.01
Diastolic dysfucntion	10	12.5	0.75	6.25	0.59	6.25	0.69	37.5	0.04

Discussion

In the present study, 100 patients of pulmonary tuberculosis were included. They were evaluated for abnormalities in pulmonary functions and left ventricular systolic and diastolic dysfunction. Majority of the patients were in 21 - 40 years age group (Table I).

The pulmonary functions were abnormal in 80 out of 100 patients. Obstructive pattern was seen in 48% patients, restrictive pattern was seen in 16% patients while mixed pattern was seen in 16% patients. The pulmonary function tests were normal in 20 patients. Among these, mild obstruction was seen in 35 patients (72.91%), moderate obstruction in 12 (25%), and severe obstruction in 1 patient (2.08%). Among the patients with mixed pattern on PFT, all had severe obstruction. Thus most commonly encountered PFT pattern was obstructive. The PFT abnormality was more commonly encountered in males as compared to females.

Sailaja *et al*[3] found 62.5% obstructive, 16.07% restrictive and 21.42% mixed abnormality in their study. Santhosh Kumar *et al*[4] evaluated patients of tuberculosis for pulmonary function abnormalities. Spirometry revealed obstructive pattern in 37 patients (45.1%), restrictive pattern in 21 patients (25.6%). It revealed a mixed pattern or normal results in 24 patients (29.3%). Chushkin *et al*[5] found pulmonary impairment in 102 (47.7%) of patients, the pattern being obstructive in 74 (34.6%), restrictive in 18 (8.4%), mixed in 8 (3.7%), and nonspecific in 2 (0.9%). These results were similar to that found in our study.

Table III and Fig. 2 show the distribution of systolic and diastolic dysfunction among patients. Systolic dysfunction was seen in 8 out of 100 patients in the study. Systolic dysfunction was mild in 6 patients and moderate in 2 patients. 6 of the 8 patients having systolic dysfunction were females and 2 were males. The systolic dysfunction was also more severe in females as compared to males in our study (see Table IV). In the study by Rajesh *et al*[6], cardiac involvement was seen in 24% patients (12 out of 50 patients). Systolic dysfunction was seen in 4% patients in their study. In another study by Dasti *et al*[7], systolic dysfunction was seen in 8 per cent of the patients which is similar to that found in present study. Echocardiographic abnormality was found in 69.4% of the patients included in the study, the commonest finding being pericardial effusion.

In contrary to systolic dysfunction which was more common and severe in females, diastolic dysfunction was almost equally distributed in both genders. 7 of 12 patients with diastolic dysfunction were males while the other 5 were females. Rajesh *et al*[6] found diastolic dysfunction in 8% patients which is 4% less than in our study. However in both the studies, diastolic dysfunction was seen more commonly than systolic dysfunction. While Dasti *et al*[7], observed diastolic dysfunction in 4% of the patients which is significantly less than in our study. Also, they observed systolic dysfunction to be more common than diastolic dysfunction which is in contrast with our study as well as with the study done by Rajesh *et al*[6]. However both studies excluded patients with abnormal PFT values. Most patients with systolic and diastolic dysfunction also had concurrent respiratory function compromise as evidenced by their abnormal PFT values. As pointed earlier, this could mean that more severe disease causing extensive lung destruction may lead to cardiac dysfunction and abnormal systolic and diastolic function of the heart.

The correlation of systolic and diastolic dysfunction among patients with normal and abnormal PFT is shown in Table VI. On correlating systolic and diastolic dysfunction in the patients with normal PFT with those with abnormal PFT, it was found to be non-significant. So, it cannot be concluded that cardiac dysfunction was more commonly seen in tuberculosis patients with abnormal PFT. Same was true when we compared systolic and diastolic dysfunction separately with the obstructive and restrictive pattern. However, the correlation of systolic and diastolic dysfunction in the patients having mixed abnormality of the pulmonary functions came out to be statistically significant (p value < 0.05 both for systolic dysfunction and diastolic dysfunction). It means that patients having extensive lung involvement due to the disease process had both restrictive and obstructive pathology in pulmonary functions and systolic and diastolic dysfunction was also seen more commonly in these patients.

Conclusion

The involvement of cardiovascular system in tuberculosis should always be kept in mind while evaluating a patient

with tuberculosis. A proper and thorough history and detailed physical examination should be carried-out and if there is suspicion of such involvement, patients should be screened with echocardiography. Some patients of tuberculosis present with dyspnoea which is not fully relieved on the correcting the respiratory parameters. Cardiac dysfunction should always be sought for in such patients as its management will improve the symptoms. Patients having extensive disease or significantly impaired pulmonary function (especially the mixed pattern of involvement) should also be screened with echocardiography.

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