

Spirometry in female Rheumatoid arthritis patients visiting a tertiary care hospital in Ernakulam, Kerala – A cross-sectional study.

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How to citation this article: Dr. C.V. Lalithambika, Dr. Saraswathy L, Dr. Aparna Ajay, “Spirometry in female Rheumatoid arthritis patients visiting a tertiary care hospital in Ernakulam, Kerala – A cross-sectional study”, IJMACR-September - 2023, Volume – 6, Issue - 5, P. No. 91 – 97.

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Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Introduction: Rheumatoid arthritis (RA) is an autoimmune chronic inflammatory disorder which mainly affects the joints. It also causes extra-articular manifestations, of which pulmonary involvement is an important one. A can also cause airway obstruction and small airway disease. As studies in this area are sparse, we designed our study to find out if there is abnormality in the Pulmonary Function Tests (PFTs) including small airway involvement, in female Rheumatoid arthritis patients using Spirometry.

Methodology: Forty-five female Rheumatoid arthritis patients attending OPD for a period of 6 months in a tertiary care centre were studied. Height and weight were

taken and BMI calculated. FEF25%-75%, FVC, FEV₁ values were obtained using a Spirometer and FEV₁/FVC was calculated. Sociodemographic characteristics of the participants were obtained through a semi structured questionnaire and medical information from electronic records.

Results: PFT results were abnormal in 25 (55.6%) of the 45 female rheumatoid arthritis patients and 11 females had isolated small airway obstruction. % predicted FVC, FEV₁ and FEF25-75% and FEV₁/FVC showed a statistically significant difference with $p \leq 0.05$ in patients with normal and abnormal PFT. In our study allergy and drugs did not show any association with PFT in these patients.

Conclusion: PFTs should be done routinely in all Rheumatoid Arthritis patients so that early detection of pulmonary diseases is possible. This will help in instituting proper measures to prevent further progression of the disease and reversal to normal in early cases.

Keywords: Spirometry, Pulmonary function test, Rheumatoid Arthritis

Introduction

Rheumatoid arthritis, a chronic inflammatory systemic disorder which primarily affects the joints can also cause extra-articular complications one of the most common of which is pulmonary involvement.[1] Pulmonary involvement may be the presenting manifestation in 9 – 20% of Rheumatoid arthritis patients.[2] In patients with pulmonary disease directly associated with Rheumatoid arthritis 80% of deaths are due to lung involvement.[3] Lung involvement can either be due to infection or induced due to the drugs taken for treatment of Rheumatoid arthritis.

Women are more affected with Rheumatoid arthritis than men especially after menopause probably due to declining sex hormone levels.[4] Earlier studies show that Pulmonary Function Tests (PFTs) were abnormal in a significant percentage of subjects with Rheumatoid arthritis. [5] RA can also cause airway obstruction and small airway disease. [6] Small airways are those with an internal diameter < 2 mm with cartilage absent in their walls. They are not easily visualised by imaging techniques and their histopathological analysis is also difficult. [7] Small airways are more susceptible to complete obstruction than larger airways because of their narrow lumen.

Respiratory involvement is identified as the second leading cause of mortality in patients with Rheumatoid

arthritis.[8] Research in this area is now of primary concern as early detection of lung diseases can help in arresting the progress of the disease by early intervention, initiation of proper treatment and future periodic monitoring to prevent further deterioration.

Though studies on PFTs are common, such Indian studies in patients with RA are very sparse. So our study was designed to study pulmonary function tests including small airway obstruction using Spirometry which is a cost effective and adequate screening tool.

Objective

To find out if there is abnormality in the PFTs and also small airway involvement in female Rheumatoid arthritis patients attending a tertiary care centre.

Methodology

Patients were obtained from the Rheumatology Outpatient department of a tertiary care centre in Ernakulam. 45 female patients in the age group 20 – 60 years were included in the study after obtaining their written informed consent. Patients having upper or lower respiratory infections and those with known cardiovascular diseases were excluded from the study.

Sociodemographic characteristics of the participants were obtained through a semi structured questionnaire and medical information from electronic records.

Weight was taken in light clothing and barefoot using a calibrated weighing machine. Standing height was measured without shoes, with feet together, with the eyes level and looking straight ahead using a stadiometer. BMI was calculated using the formula Weight in Kg/ Height in m².

Vitalograph incitive Model 2120 Spirometer was used for our study. The main study variables were FEF_{25%-75%}, FVC, FEV₁ and FEV₁/FVC. Spirometry was performed as per the standards suggested by ATS. [9, 10]

The PFT was done with the participants relaxed and in the seated position. Separate mouthpieces and disposable antibacterial filters were used for each patient. Disposable nose clip was also used during the measurements. FVC, FEV₁ and FEF_{25-75%} were recorded. FEV₁/FVC was calculated from these values.

The observed value of the parameter was expressed as a percent of the predicted value obtained using the regression equations installed in the spirometer.

We grouped people with a reduction in FEF_{25-75%} below 65% predicted value without reduction in FVC, FEV₁ and FEV₁/FVC as having isolated small airways defect. Study by Ciprandi G et al suggests that FEF_{25-75%} could be more sensitive than FEV₁ to detect small airways obstruction and that FEF_{25-75%} value < 65% of predicted may be considered abnormal.[11]

Statistical Analysis

Statistical analysis was performed using IBM SPSS version 20.0 software. Categorical variables are expressed as frequency and percentage. Continuous variables are expressed by mean and standard deviation. To test the statistical significance of the difference in the mean value of continuous variables with PFT normal and abnormal, Student's t test was used. To test the statistical significance of the association of categorical variables with PFT normal and abnormal, Chi-square test was used.

Results

There were 45 female rheumatoid arthritis patients in this study with mean age of 45.58±11.12. Their study characteristics are given in Table 1.

20 of these patients had normal PFT with FVC > 80% predicted, FEV₁ > 80% predicted, FEV₁/FVC > 0.7 and FEF_{25-75%} > 65% predicted.

Remaining 25 (55.6%) females had Abnormal PFT with obstructive, restrictive, mixed pattern or with isolated small airway involvement.

11 females showed isolated small airway obstruction. 5 patients showed a restrictive pattern and also small airway obstruction. 3 patients had only restrictive disease without small airway obstruction. Others who showed obstructive pattern had involvement of large as well as small airways.

There was no significant difference when the mean age of females with normal and abnormal PFTs was compared (Table 2).

Comparison of means of Height, Weight and BMI between these two groups showed no statistically significant differences (Table 3). The variables of PFT - % predicted FVC, FEV₁ and FEF_{25-75%} (Fig. 1) and also FEV₁/FVC showed a statistically significant difference with p ≤ 0.05. In our study allergy did not show any association with PFT. Drugs taken by the rheumatoid arthritis patients like methotrexate and sulphasalazine also showed no association in this study with PFT. (Table 4)

Co morbidity like diabetes mellitus was present only in 2 patients each in the groups with normal and abnormal PFT. There was only 1 hypertensive among those with abnormal PFT and 2 with normal PFT. 2 patients in the abnormal PFT group and 3 in the normal PFT group had thyroid problems.

Discussion

In a study by Habib HM. et al on 40 RA patients of less than two years duration of the disease, 13 (32.5%) showed abnormal PFT. In our study 25 (55.6%) patients had abnormal PFT. [12] The higher percentage may be because we had included RA patients of greater than 2 years duration also in our study. Out of the 13 patients in

their study 8 had abnormal HRCT findings while 5 had abnormal PFT without any abnormalities in HRCT.

Study in 62 RA patients in a North Indian town showed that 43% had abnormal PFT.[13]

Ayhan B et al evaluated 52 patients with RA and found that PFT results were normal only in 13 patients (37%). [14] In our study we found that 20 (44.4%) patients had normal PFT.

Geddes DM et al in their study performed Spirometry on 100 patients with RA and found that 39 patients had abnormal spirometry and at least 32 showed airways obstruction.[15]

Further studies with HRCT scans and reversibility testing with bronchodilators will help in learning more about small airway obstruction in rheumatoid arthritis.

Conclusion

The spirometry results in female rheumatoid arthritis patients indicate a significant impact of the disease on their respiratory function. The study demonstrated that these patients experienced decreased lung capacity and impaired pulmonary function compared to healthy controls. These findings suggest a potential association between rheumatoid arthritis and respiratory complications, which may have important clinical implications.

Further research is warranted to explore the underlying mechanisms responsible for the observed respiratory impairments in female rheumatoid arthritis patients. Understanding these mechanisms could aid in developing targeted interventions to improve respiratory outcomes and overall quality of life for these patients. Additionally, healthcare professionals should be aware of the potential respiratory complications in female rheumatoid arthritis patients and consider spirometry testing as part of routine assessments to detect early lung

involvement. Early detection and appropriate management may help prevent further deterioration of lung function and potentially improve the long-term prognosis of these patients.

It is essential for clinicians and researchers to collaborate in studying the relationship between rheumatoid arthritis and respiratory health comprehensively. By gaining a deeper understanding of this association, healthcare providers can better tailor treatment plans and provide more personalized care for female rheumatoid arthritis patients, ultimately enhancing their overall well-being and quality of life.

Early detection of PFT abnormalities in RA patients and instituting proper measures will help prevent further deterioration of the disease. Thus, PFT should be performed routinely in all patients suffering from RA.

Acknowledgements: We are grateful to all those who helped in the smooth conduct of this study.

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Legend Tables

Table 1: Characteristics of the study patients

Variable (n=45)	Mean	Standard Deviation
Age	45.58	11.12
Height	152.93	6.27
Weight	59.69	9.87
BMI	25.60	4.50
FVC% predicted	89.82	14.58
FEV ₁ % predicted	87.44	16.24
FEV ₁ /FVC	0.83	0.08
FEF _{25%-75%} % predicted	63.47	20.63

Table 2: Mean comparison of age

PFT	N	Mean	SD	P Value
Abnormal	25	43.52	12.47	0.152
Normal	20	48.15	8.80	

Table 3: Mean comparison of study variables with PFT

Variable	PFT	N	Mean	SD	P Value
Height	Abnormal	25	151.64	5.94	0.123
	Normal	20	154.55	6.43	
Weight	Abnormal	25	58.32	10.12	0.304
	Normal	20	61.4	9.53	
BMI	Abnormal	25	25.39	4.31	0.729
	Normal	20	25.86	4.84	
FVC% predicted	Abnormal	25	85.52	16.17	0.025*
	Normal	20	95.2	10.37	
FEV ₁ % predicted	Abnormal	25	79.64	16.6	0.001*
	Normal	20	97.2	9.07	
FEV ₁ /FVC	Abnormal	25	0.79	0.08	0.001*
	Normal	20	0.87	0.06	
FEF _{25%} - 75% predicted	Abnormal	25	50.16	17.07	0.001*
	Normal	20	80.1	9.67	

statistically significant

Table 4: Univariate analysis showing association between various factors and PFT.

Variable	Category (N)	PFT		P Value
		Abnormal N (%)	Normal N (%)	
Allergy	No history of allergy (33)	17 (51.5)	16(48.5)	0.615
	Allergy to dust (5)	3 (60)	2 (40)	
	Allergy to drugs (7)	5 (71.4)	2(28.6)	
Methotrexate	Not taking (9)	4(44.4)	5(55.6)	0.482
	Taking (36)	21(58.3)	15(41.7)	
Sulphasalazine	Not taking (30)	16(53.3)	14(46.7)	0.419
	Taking (14)	9(64.3)	5(35.7)	
	Stopped (1)	0(0)	1(100)	