



STUDY OF PATTERN OF LUNG FUNCTION TESTS IN RHEUMATOID ARTHRITIS PATIENTS.

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ABSTRACT

BACKGROUND: Rheumatoid arthritis (RA) is a chronic inflammatory disease characterized by a painful symmetrical peripheral polyarthritis. Extra-articular involvement in RA is a common condition. Pulmonary involvement occurs in 20 to 68 % of RA patients and it is responsible for about 10-20 % of mortality in RA patients.

AIMS AND OBJECTIVE: To Study the Pattern of lung function tests in rheumatoid arthritis patients.

MATERIALS AND METHODS: A case control study conducted at Madhubani Medical College, a teaching hospital in the Department of Medicine from April 2019 to March 2020. Fifty RA patients 31(62.0%) female and 19(38.0%) male and fifty apparently healthy subjects 35(70.0%) female and 15(30.0 %) male were included in the study. All subjects had subjected to a pulmonary function test (PFT) for pulmonary function evaluation using MIR Spiro lab III. Measured and predicted forced vital capacities (FVC), forced expiratory volume in the first second (FEV1) and FEV1 / FVC ratio were considered as the parameters in this study for both groups.

RESULTS: Nine patients were found to have a restrictive pattern of pulmonary function test, while obstructive pattern was found in only one patient. On the other hand, the pulmonary function tests were normal in all of fifty healthy controls. The experimental group of forced vital capacity (FVC) was 2.2866 ± 0.58186 , forced expiratory volume in 1 s (FEV1) was 1.6894 ± 0.49072 , FEV1/FVC was 0.81 ± 0.12 , forced expiratory flow in 26-76% (FEF 26-76%) was 1.736 ± 0.89667 , peak expiratory flow rate (PEF) was 4.2328 ± 1.39828 , FIVC was 1.8936 ± 0.85744 , and PIF was 2.1146 ± 1.25958 were significantly lower when compared with the control group.

CONCLUSION: Different pattern of pulmonary function abnormalities could be manifested in RA patients and the restrictive pattern represents the most common feature. Spirometry is indicated as a baseline assessment and for follow up of RA patient to enhance early detection and management of the pulmonary involvement.

KEYWORDS : Pulmonary function test, Rheumatoid arthritis, Spirometry.

INTRODUCTION:

Rheumatoid arthritis (RA) is a chronic inflammatory disease characterized by a painful symmetrical peripheral polyarthritis. It affects multiple body organs in addition to joints' surrounding tissues and it is a leading cause of joints deformities and disabilities. Rheumatoid arthritis can develop at any age with increased incidence between 35 and 55 years of age [1]. The prevalence of RA is approximately 0.5-1% worldwide with some variability among different populations [2]. In Iraq it is prevalence is 1% [3]. Highest prevalence was recorded in Pima Indians and Chippewa Indians, whereas the lowest in Japan and China [4, 5]. Rheumatoid arthritis more commonly occurs in females than in males with age related differences. Younger onset RA female to male ratio is 4.4:1 while in elderly onset RA, the ratio is 1.6:1 [6].

Extra-articular involvement in RA is common. It was recorded in 51% of 587 RA Italian patients, and the manifestation was more common in male patients, in positive antinuclear antibody and in rheumatoid factor positive patients [7]. In addition to rheumatoid nodules, other organs could be involved in the disease process including heart, lung, blood vessels, peripheral nerves as well as hematological involvement. The occurrence of extra-articular pulmonary manifestation of RA ranges from 20 % in some studies to as high as 67% in others [8, 9]. Respiratory airways, pleura, lung parenchyma and vascular compartment all may be attacked by RA [10]. In the majority of RA patients, arthritis develops first, whereas in others, pulmonary involvements could proceed or simultaneously occur with arthritis [11] Different forms of interstitial lung disease (ILD) occur in RA patients. They are a group of heterogeneous parenchymal lung disorders characterized by their clinical, pathological and radiological features [12]. The most commonly observed ILD in RA patients are usual interstitial pneumonia, nonspecific interstitial pneumonia and inflammatory airway disease with organizing pneumonia pattern [11]. It has been estimated that pulmonary complications are responsible for 10-20% mortality in RA patients which is mostly caused by ILD [13].

AIMS AND OBJECTIVE:

The aim of this study is to evaluate the extent and abnormality of pulmonary function test in RA patients by using Spirometry.

MATERIALS AND METHODS:

A case control study conducted at Madhubani Medical College,

Madhubani, Bihar, a teaching hospital in the Department of Medicine from April 2019 to March 2020. The study was approved by the Institutional Ethical Committee. Written informed consent was obtained from all the participants.

Inclusion Criteria

Proven RA patients on rheumatoid drugs (ARA Criteria, 2010)
Absence of respiratory symptoms
Age group – 25-60 years.

Exclusion Criteria

Age <25 years, >60 years
Smokers, alcoholics
Pregnancy
Any previous respiratory and cardiac disease
Previous significant chest injury

Procedure

The participant was made to relax and should wear comfortable loose clothing. The participant was made to sit comfortably and nose clip was applied on the nose. The spirometer was kept in the mouth with the lips sealing around it. The participants were instructed to breathe calmly and care should be taken not to block or bite the spirometer. The participants were asked to do tidal breathing and fill the lungs completely and then asked to exhale as hard and fast as possible until the lungs were completely empty and inhale as hard and fast as possible till the end of the test. This test was repeated 2-3 times and the best value was taken for the result.

Statistical Analysis:

The data collected were analyzed using Statistical Package for the Social Sciences version 21. Statistical analysis was performed using independent t-test to compare the lung function tests between the healthy controls (control group) and RA patients (experimental group). The $P < 0.05$ was considered as statistically significant.

RESULTS:

The study was performed in 100 participants (50 control group and 50 experimental groups). 84% were female participants and 16% were male participants.

Table 1 describes about the anthropometric values of our study population. The mean age of the experimental group is 42.85 ± 6.88 years. The mean height and weight are 155.6 cm and 60.64 kg, respectively. The mean body mass index is 22.4 ± 5.0 .

Table 1: The anthropometric measurements

Parameters	Groups	N	Mean \pm Standard Deviation	Independent t-test	P value
Height	Control	50	163.4400 \pm 6.875	4.522	0.0001
	Experimental	50	155.6000 \pm 7.887		
Weight	Control	50	64.9200 \pm 10.083	1.530	0.129
	Experimental	50	60.6400 \pm 12.410		
BMI	Control	50	24.1900 \pm 3.630	0.324	0.747
	Experimental	50	22.4116 \pm 5.002		
Age	Control	50	39.1800 \pm 5.793	1.990	0.049
	Experimental	50	42.8500 \pm 6.889		

BMI: Body mass index

The comparison of lung parameters between the control and experimental group are mean of experimental group of forced vital capacity (FVC) was 2.2866 ± 0.58186 , forced expiratory volume in 1 s (FEV1) was 1.6894 ± 0.49072 , FEV1/FVC was 0.81 ± 0.12 , forced expiratory flow in 26-76% (FEF 26-76%) was 1.736 ± 0.89667 , peak expiratory flow rate (PEF) was 4.2328 ± 1.39828 , FIVC was 1.8936 ± 0.85744 , and PIF was 2.1146 ± 1.25958 were significantly lower when compared with the control group.

DISCUSSION:

In this study, the pulmonary functions were performed in 50 rheumatoid patients and compared them with normal controls. Restrictive ventilatory defect is seen in 64% of rheumatoid patients with FEV1/FVC >71% and reduced vital capacity and total lung capacity. Obstructive ventilatory defect is seen in 10% of rheumatoid patients since the FEV1/FVC <80% with increased residual volume and total lung capacity ratio. Remaining 26% of participants were normal. Lung parameters such as FVC, FEV1, FEV1/FVC, FEF 26-76%, PEF, and FIVC were significantly lower in rheumatoid patients when compared with normal controls. Fuld et al [14] found that the prevalence of pulmonary function abnormalities was higher in asymptomatic rheumatoid patients when compared with the reference population. Avnon et al [15] noted restrictive pulmonary abnormalities in 25.6%, small airway disease in 14.6%, and obstructive in 27%. Cortet et al [16] and Radoux et al [17] found small airway obstruction is seen in 50% of cases with decrease in FEF 26-76%. There was associated increase in antinuclear antibody [18]. Restrictive ventilatory defect may be due to activation of immune complexes in the alveolar walls. It results in the release of myeloperoxidase, collagenase, and elastase. There is destruction of lung tissue by phagocytosis and protease – Antiprotease imbalance preventing the lung expansion. Banks et al [19] stated restrictive type of lung disease with reduction in mid-expiratory flow.

Restrictive pattern was seen with reduction in FEV1/FVC ratio [15] Gowdhaman et al [18] reported restrictive type with decrease in vital capacity. Bilgici et al [19] and Vergnenègre et al [20] noted obstructive type of lung disease. Vergnenègre et al [21] reported a significant reduction in FEF 25-75%, FEV1/FVC. In RA, obstructive ventilatory defect may be due to airway inflammation. Plasma immunoglobulin E level increases. Neuropeptides and chemokines are released from eosinophils, and mast cell damages the airway epithelium and hyper responsiveness. This results in partially reversible airway obstruction due to bronchial narrowing. Devouassoux et al [22] found that there is airflow obstruction with decreased FEV1/FVC and hyperinflation with increased residual volume and total lung capacity ratio. Cimen et al [23] found airway obstruction in 28% of cases. Hassan et al [24] reported that airway obstruction may be due to mucosal edema as a result of airway inflammation which leads to bronchial narrowing. The current study states that pulmonary manifestations are common in RA which is of restrictive type.

CONCLUSIONS:

The lung is a potential target organ of the RA inflammatory disease process that could precede the onset of the synovial joint involvement. Different pattern of pulmonary function abnormalities could be manifested in RA patients and a restrictive pattern represents the most common feature. Spirometry test is indicated as a baseline assessment and follow up for RA patient to enhance early detection and management of the pulmonary involvement. Pulmonary manifestations are one of the common extra articular manifestations in

RA. It is often asymptomatic. They can be evaluated with pulmonary function tests, chest radiography, and CT scan. In this study, restrictive ventilatory defect is more common than obstructive type. Pulmonary function test can be used as screening test for early detection of the abnormalities and disease activity.

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