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A study of C-reactive protein in agro based and wood industries exposure and their correlation with pulmonary function parameters

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Abstract

Respiratory illness is very common in agro based and wood industries. The changes in the lung are subtle at first but very progressive. A correlation of the biochemical parameter to the spirometric values of lung function parameters may be useful in selecting an alternative test parameter to assess lung function in conditions where performing spirometry is difficult. Assessment of inflammatory marker, c-reactive protein (CRP) along with pulmonary function test parameters, forced expiratory volume at first second (FEV₁), forced vital capacity (FVC) and their ratio (FEV₁/FVC) in the exposed and comparing with controls is the main aim of the study. Correlation of biomarkers with pulmonary function test results.

Keywords: CRP, spirometry, pulmonary function test

Introduction

Respiratory illness is very common in agro based and wood industries. The changes in the lung are subtle at first but very progressive. People exposed to wood dust would be undergoing cytotoxic effects leading to inflammation and release of reactive oxygen species ^[1], which are responsible for the development of oxidative stress at the cellular level. The inflammation may lead to the fibrosis of the lung tissues, thus defective oxygen diffusion and impaired lung functions ^[2]. The measured values of certain spirometric parameters like FEV₁, FVC and FEV₁/FVC may be useful in identification of obstructive or restrictive lung defects ^[3]. In a study conducted on workers of wood industry, the vital capacity (VC) and FEV₁ were found to be lower than expected ^[4]. Similar observations were recorded by another study on sawmill workers [5]. Exposure to wood dust was found to cause increased levels of serum CRP and MDA ^[1, 6, 7]. A correlation of the biochemical parameter to the spirometric values of lung function parameters may be useful in selecting an alternative test parameter to assess lung function in conditions where performing spirometry is difficult.

Aims and Objectives: Assessment of inflammatory marker, c-reactive protein (CRP) along with pulmonary function test parameters, forced expiratory volume at first second (FEV₁), forced vital capacity (FVC) and their ratio (FEV₁/FVC) in the exposed and comparing with controls.

Results

Table 1: Comparison of mean values of BMI, respiratory rate, FEV₁, FVC, FEV₁/FVC, CRP in cases and controls

Parameters	Cases(n=100)	Controls(n=100)	p value
BMI (kg/m ²)	21.82±5.48	23.47±4.48	<0.05*
Respiratory rate	16.98±1.96	17.21±1.56	0.38
FEV ₁ (L)	2.71±0.64	3.45±0.42	< 0.01*
FVC (L)	2.21±0.41	3.12±0.51	< 0.01*
FEV ₁ / FVC (%)	81.46±8.12	88.02±1.95	< 0.01*
CRP (mg/L)	7.71±3.61	2.97±2.73	< 0.01*

The table clearly indicates the correlation changes of CRP when compared to that of spirometric changes.

Discussion

The spirometric values of FEV1, FVC and FEV1 / FVC calculation may be useful in identification of obstructive or restrictive lung defects^[3]. A FEV1 / FVC ratio < 70% is an indicator of obstructive pulmonary disorder where decrease in FEV1 is more than FVC^[3], where as in restrictive lung diseases both FEV1 and FVC are reduced. Thus, based on our findings, we may be able to say that obstruction to pulmonary system is less significant in agro - based workers in the present study. However, the ratio was significantly lower in agro based industries workers compared to non-agro based industry workers. FEV1 measurements are usually done to assess the mechanical properties of the lungs and the values are reduced in both obstructive and restrictive pulmonary diseases^[9, 10]. In the present study, a significant reduction in FEV1 in agro - based workers compared to the non-agro - based working controls maybe an indicator of pulmonary functioning abnormality in agro - based workers, similar observations were recorded by previous studies as well^[5, 11, 12].

Lung volume may be measured in terms of FVC and the values are reduced in the restrictive pulmonary disorders. However, severe obstruction in the lungs may also lead to reduction in FVC, thus it may not be a relative indicator of restriction or total lung capacity^[10]. Lower levels of FVC among agro - based workers coincide with the previous studies^[5, 11], indicator of poor pulmonary function. Minute saw dust particles may be inhaled by the workers which might have caused the infection of the respiratory system and obstruction to the airways.

The marker of inflammation, CRP and marker of oxidative stress, CRP is an acute phase protein, the level of which determines the intensity of inflammation^[11]. CRP is one of the first acute phase protein that is associated with air pollution^[13]. A correlation between ambient particle exposure and CRP levels in serum was found in children below 18 years, but poor association was found in adults^[14]. Increased levels of CRP also have an association of doubling the risk of coronary heart disease^[14]. Present observation is in accordance with the findings of Wultsch *et al.*^[1], where they compared the CRP levels between the workers who were exposed only to wood dust and those who were exposed to wood dust as well as volatile organic compounds. Elevated CRP levels in the workers of agro - based maybe plausibly due to exposure to wood dust which is known to cause respiratory infection and inflammation^[13,15].

Conclusion

Exposure to wood dust reduces the pulmonary functioning capacity, causes inflammatory responses and increases the oxidative stress. A correlation of pulmonary function parameters with markers of inflammation and oxidative stress is the novelty of the present work.

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