

To Study the Relation Between PFT Abnormalities and Nasal Smear in General Population Residing in and Around Quarry in Zamin Pallavaram, Chennai

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ABSTRACT

The percentage predicted value of FVC (74.58 ± 20.59) was lesser than the percentage predicted value of FEV1 (77.41 ± 21.17) indicating that the vital capacity of the lung was more affected. It is evident that all the spirometric variables except FEV1 % (FEV1/FVC ratio) are decreased, i.e., they are less than 80%. Hence it can be seen that both FEV1 which indicates the large airways, and FEV25-75% that indicates smaller airways are both affected in our study population. The fibroblast stimulation factors that are released, cause collagen deposition and hyalinization. Hence the final lesion is a hyaline nodule, which contains a central zone with free silica that is surrounded by fibroblasts and collagen. Hence, the silica particles, which are deposited cause irritation of the respiratory mucosa, hypertrophy of the sub mucosal glands and hyper secretion of mucus. The hyper secretion especially in the large airways is stimulated by the proteases released from the neutrophils. We can see that there is slight increase in the hemoglobin level in the people having obstructive lung disease though it may not be significant. It is evident that the total WBC count is not much altered in the affected groups when compared to people with normal pulmonary function, there is significant change in the lymphocyte % in the people with restriction.

Key words: Spirometric variables, Collagen, Hyaline

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INTRODUCTION

It is known that air pollution is associated with increased cardiopulmonary morbidity and mortality. Air pollution can be broadly classified into two categories namely (a) reducing type pollution from combustion and photochemical pollution - from reactions involving UV radiation. Though several studies have been done to find out the lung function in stone quarry workers, or miners, only a very few studies have been done to know the effect of industries such as mining industries, stone crushing industries, cement industries on the general population living around the industries which are a potential source of air pollution. Some of the studies show that even low dust level exposure for longer duration can affect the lung functions in the workers because of their exposure to silica dust [1-5]. On the other hand, risk of developing respiratory diseases is more in children and females due to emissions of industries for those who are living near them. Lung function is assessed with the help of spirometry. Restriction or obstruction of the lung can be measured with the help of several spirometric measures. Spirometry gives three important measures:

- FEV1 (Forced Expiratory Volume in first second) - it is the volume of air that the patient can exhale in the first second of forced expiration. It is used as a measure of airway obstruction.
- FVC (Forced Vital Capacity) IS the total volume of air that can be expired after a maximum inspiration.
- FEV1/FVC: It is the ratio of FEV1 to FVC. It is expressed as a percentage.
- The extent of FEV1 reduction indicates the severity of airflow obstruction.

Pulmonary function tests are a significant key factor to assess the respiratory health. Plenty of studies are being done so far to find out the impact of pollution on lungs. From the findings it is said that elevated particulate matter exposures influence the impairment of lung functioning [1,2]. Some of the studies show that even low dust level exposure for longer duration can affect the lung functions in the workers because of their exposure to silica dusts. So, keeping these issues in mind, we aimed to test the pulmonary function of the general population who live around the Quarry or stone crushing unit in Zamin Pallavaram, Chennai, Tamil Nadu.

METHODOLOGY

Study design

This study was carried out in the Department of Physiology, Sree Balaji Medical College and Hospital. We recruited 60 subjects who were residents of Zamin Pallavaram, Chennai. Study was conducted after obtaining approval from the Institutional Ethical Committee. Questionnaire was given to all subjects to obtain information regarding family history, history of allergic rhinitis, duration of stay in that, area. A well-informed consent was obtained from all those who participated in the study. Pulmonary function tests, blood investigations and nasal smear was all done on the same day.

The subjects were included in the study based on the following inclusion and exclusion criteria.

Inclusion criteria

- They must be residents of Zamin Pallavaram.
- Age group: 20-60 years of age.

Exclusion criteria

- Smokers.
- h/o of tuberculosis.
- any acute respiratory illness.
- H/o recent surgeries.
- Pregnant women.
- h/o hypertension.
- h/o hernia.
- h/o cardiovascular diseases.
- h/o COPD.
- h/o Interstitial Lung diseases.

A study population of age group 20-60 years were included. The blood samples collected were analysed for

the biochemical (RBC, TC, DC) and pathological (Hb%, MCV, MCH, MCHC, PCV) blood parameters then pulmonary function test was performed by measuring FEV1 (Forced Expiratory Volume in first second). Nasal smear was also collected and stained to observe neutrophils and eosinophils.

Statistics

All the values were expressed as Mean \pm SD. The various spirometry variables namely FEV1, FVC, FEV1/FVC ratio (FEV1 %), PEF, FEF 25-75 were compared between the predicted value and measured value using the two-tailed unpaired t test. One-way ANOVA was done to find the significant difference between the various parameters of haematological indices with the pulmonary function abnormalities. Post Hoc analysis was also done.

RESULTS

Table 1 shows the comparison of pulmonary function abnormalities with various haematological indices. It is evident from the table there is not much change in the RBC count between the people having normal lung function and those having abnormalities. However, the Hb% is found to be increased in those having obstructive lung disease. Also, highly significant change in MCV is seen in people with restrictive lung disease. Similarly, the changes in MCHC are also highly significant in people with restrictive lung disease. The PCV is also found to significantly change in the group of people having restrictive lung disease. Table 2 displays the various spirometry variables namely FEV1, FVC and FEV1% and flow rates namely PEF, FEF 25-75% of the study population. All the values have been expressed in mean \pm standard deviation. Unpaired two-tailed t-test was used to find the significance. We can observe that except FEV1/FVC (i.e., FEV1 %), all other parameters are decreased i.e., <80%.

Table 1: Comparison of pulmonary abnormalities with haematological indices.

PFT changes	RBC COUNT (4.5-5.5 millions/cu.mm.)	Hb% (12-16) gm/dl	MCV fl (78-96 fl)	MCH pg (27-33 pg)	MCHC gm/dl (30-37 gm/dl)	PCV % (40-47%)
Normal	4.6 \pm 0.42	12 \pm 1.8	80 \pm 11	26 \pm 3.1	34 \pm 4	45 \pm 5.6
Obstructive	4.9 \pm 1.00	14 \pm 3-!	82 \pm 4.2	28 \pm 2.1	34 \pm 2	40 \pm 1.0
Restrictive	4.9 \pm 0.45	12 \pm 1.3	90 \pm 13**	26 \pm 2.5	30 \pm 3.9**	42 \pm 4.9*
Mixed	4.5 \pm 0.46	13 \pm 2.2	81 \pm 10	28 \pm 3.4	34 \pm 2	38 \pm 3.8

Table 2: Spirometry variables and flow rates of study population.

Parameters	Predicted value	Measured value	Percentage predicted
FEV1 (L)	2.18 \pm 0.52	1.66 \pm 0.64	77.41 \pm 21.17*
FVC (L)	2.61 \pm 0.59	96 \pm 0.76	74.58 \pm 20.59*
FEV1/FVC ratio (FEV1 %)	90.87 \pm 22.99	85.85 \pm 141	102.55 \pm 37.99

PEFR (L/S)	6.73 ± 1.17	4.77 ± 1.53	75.62 ± 22.88*
FEF2s-1s	3.07 ± 0.65	2.21 ± 1.08	71.87 ± 34.20*

*-Significant (p<0.05)

No significant change in the total WBC count is seen between those having normal pulmonary function and those having abnormal pulmonary function. However, there is significant change in the Lymphocyte % between the restrictive group and others. Other parameters like neutrophil, eosinophil, basophil, and monocytes showed no significant changes (Figures 1-3).

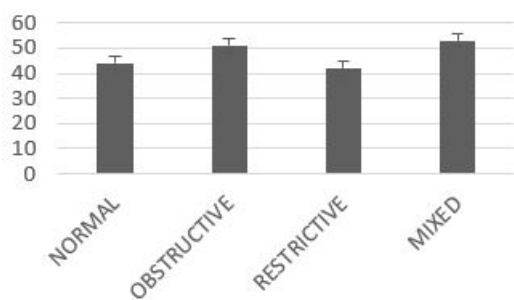


Figure 1: Neutrophil count.

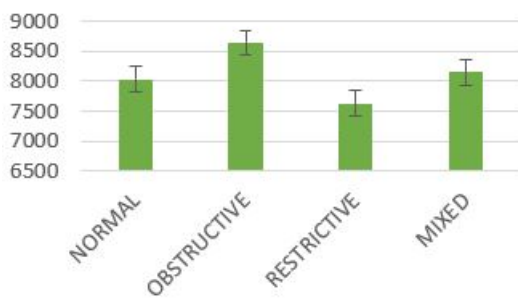


Figure 2: Total WBC count.

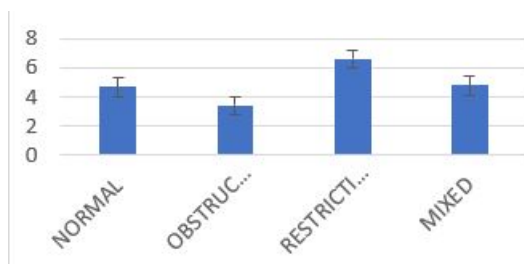


Figure 3: Eosinophil count.

DISCUSSION

Percentage predicted value of various spirometry valuables were found to be less than 80% except FEV1%. The percentage predicted value of FVC (74.58 ± 20.59) was lesser than the percentage predicted value of FEV1 (77.41 ± 21.17) indicating that the vital capacity of the lung was more affected, which is similar to previous studies done [3,4]. This shows that restrictive lung disease was more prevalent in our study population these results are in concurrent with previous studies which stated that nasal cytogram for eosinophilia is equally efficient in

diagnosing allergic respiratory diseases and that it can be used as an alternative to periph smear for eosinophilia which is invasive.

An-Soo Jang demonstrated that the bronchial hyperresponsiveness may be due to nasal eosinophilic inflammation. In our study, Nasal smear was positive for two out of three subjects who had obstructive lung disease. Those who had restrictive lung disease were negative for nasal smear for eosinophils and the cytology had predominantly neutrophils.

There was significant difference in the lymphocyte % the restrictive group indicating the role of chronic inflammation in the pathogenesis of restriction. However, the difference in eosinophil % was non-significant. The allergic response in obstructive lung disease was evident by the presence of eosinophils in nasal smears [6-10].

Hence it can be concluded that residing near quarry or stone crushing unit may affect the pulmonary function while the pulmonary function abnormalities may be reflected by changes in the blood parameters and that the type of abnormality may be linked to the duration of exposure to the quarry dust.

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ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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