

## Assessment of Obstructive and Restrictive Impairments Among of Urban Population of Jaipur: A Survey Study

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### Abstract

The Spirometry is the test usually used to diagnose the capacity of lungs. Spirometry which signifies meant the measurement of breath. The Spirometry is routinely performed as part of the pulmonary function tests (PFTs). It is used to measure the Lung Function with specific importance to the amount (volume) and/or speed (flow) of air that can be inhaled and exhaled. The used of this test involved in assessing breathing patterns that identify conditions such as asthma, pulmonary fibrosis, cystic fibrosis, and Chronic obstructive pulmonary disease (COPD). It is also helpful as part of a system of health surveillance, in which breathing patterns are measured over time. The present study focused on the patterns of the Obstructive and Restrictive Impairments among of urban population of Jaipur. The patients selected specifically from the visiting patients with some symptoms to the health camp. In this camp the assessment of Lung Functions was done by using the RMS Helios 401 PC based Spirometer. The parameters, as per the manual are used for the diagnosis of the Obstructive and Restrictive Impairments. The parameter assessed includes Age, Height, Weight, Gender, Smoker/ Non-Smoker, FVC Pred, FVC (M. Pred), % Pred. M., % Pred, Lung Age (P), Lung Age (M). As per the instrument manual restrictive stage COPD as FEV1/FVC  $\geq 70\%$  and FEV1  $< 80\%$ . In the present study the COPD before the medication mentioned as pre-test is found to be 144 patients in the total numbers of 164 which accounts for 87.80%.

**Keywords:** Spirometry; Lungs; COPD; FVC; FEV1.

### Introduction

Spirometry is the technology used for the detection of Lung Functions. The various indications for the use of spirometry are early detection of asthma and COPD, evaluation of the relationship between flow and volume, measurement of the degree of airflow obstruction and variability, severity of lung disease, assessment of response to therapy, to provides education and feedback for patients, preoperative evaluation. Lung functions tests are routinely performed for the estimation of Pulmonary Functions which include both physiological and

pathological which can be responsible for alter in Lungs functions as well. Lung functions were prescribed when physician or pulmonologists observed the related symptoms and the tests include the estimation of lung volumes are forced vital capacity (FVC), forced expiratory volume in the first second (FEV1) and peak expiratory flow rate (PEFR) (Nku CO *et al.* 2006)

The peak expiratory flow rate (PEFR), residual volume (RV), functional residual capacity (FRC) and FEV1 expressed as a percentage of FVC are the various parameter used to differentiate between obstructive and restrictive impairments (Donnelly PM *et al.* 1991).

### Aims and Objectives

To perform PFT in normal persons (control group)

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and having symptoms of impairments (study group)

To compare the values of PFT parameters in normal persons (control group) and having symptoms of impairments (study group)

## Materials and Methods

### Selection of Subjects

The study was undertaken during the Health camp organized in the urban area of Jaipur. The selection is based on the medical history taken by the Doctor and referred for the PFT.

### Inclusion Criteria

Healthy subjects with

- a) No previous history of upper respiratory tract infection within 3 months (Fulambarker A, *et al.*, 2004).
- b) No history of asthma or bronchitis in the subjects as well in their family
- c) No other clinically detected medical illness
- d) No history of smoking

### Exclusion Criteria

Subjects who were smokers (Fulambarker A, *et al.*, 2004), have had history of respiratory disorders or diseases like tuberculosis, congenital cardiac disorders and musculoskeletal deformity of chest wall were excluded.

On selection through the above inclusion criteria, their socio demographic data was recorded. The patients and normal persons underwent general physical examination and thorough clinical examination of respiratory system to rule out significant pre-existing pathology which may influence the study parameters.

All normal persons and patients physical characteristics like height and weight was measured and recorded. Body surface area will be calculated for each person, by the software incorporated in the spirometer. PFT was assessed in the subjects selected. The test was done on a normal survey day. Lung function parameters, i.e, FEV1, FVC, FEV1/FVC ratio were measured using the below described instrument, by the below described method.

Instrument: The Spirometer used for this study is RMS Helios Spirometer- 401.

## Procedure of Recording

Pulmonary function test (PFT) parameters, viz. Inspiratory reserve volume (IRV), Expiratory reserve volume (ERV), Forced vital capacity (FVC), Forced expiratory volume in the first second (FEV1) and FEV1/FVC ratios were recorded using computerized spirometer- RMS Helios 401.

The persons were asked to perform the PFT at least three times to observe FVC, FEV1, FEV1/FVC%. After appropriate coaching, the best of three technically acceptable attempts were recorded and the best of the three results were considered for analysis. Subjects were instructed to practice the maneuver before being attached to the instrument. To achieve good results before the test, the subjects were familiarized with the machine and the detail instructions and demonstration up to the satisfaction were done (Vijayan VK *et al.* 1990). The persons were asked to loosen tight clothing and were seated comfortably erect with feet firmly on the floor (the most comfortable position, though standing gives similar results in adults). A nose clip was applied to the person's nose. Then, the person was asked to breathe in fully.

The following precautions were observed while doing the test

- Seal his lips around the disposable mouth piece.
- Blast air out 'As fast as far as he can' until the lungs are completely empty.
- Breathe in again as forcibly and fully as possible.
- Inspiration should be full and unhurried and expiration once begins should be continued without a pause.

The best report out of the several blows ranging from 3 to 4 was selected. The FEV1 between the highest and second highest result value was considered.

The largest of three FVC and FEV1 values were accepted even if the two volumes do not come from the same curve. The ratio of FEV1 to FVC were expressed as a percentage (Vijayan VK *et al.* 2000) .

The largest volume was quoted. The following guidelines were used for the manoeuvre performance.

- Minimum of 3 acceptable blows.
- Rapid start is essential.
- A minimum exhalation time of 6 seconds

- Spirometer temperature being 17 to 40°C.
- Take largest FEV1 even if not from the same curve as the best FVC.
- Smooth, rapid take off with no hesitation, cough, leak, tongue obstruction, glottis closure, etc.
- Reproducibility: the highest and the second highest FEV1 should agree to within 0.2 L.

Spirometer was calibrated periodically with an accurate 3 liters syringe. The persons were asked to take a deep breath until he/she breathes in up to total lung capacity (TLC) and close the lips around the mouth piece, and to breath out as fast as possible (up to residual volume), and finally breathe it all in again as fast as possible to TLC.

The values for Age, Height, Weight, Gender, Smoker/ Non-Smoker, FVC Pred, FVC (M. Pred), FVC%, Lung Age (P), Lung Age (M) for each person thus obtained was entered in the proforma and tabulated. Suitable statistical methods were applied using Microsoft Excel to analyze the data, such as, mean, standard deviation.

## Results

**Table 1:** Showing the Age Group classification and patients with Restrictive Impairments

Age Group	Numbers	Percent of total persons under study	Number of normal persons	Number of Restrictive Impairments	Percent of Restrictive Impairments
11-20	11	6.14	02	09	81.81
21-30	61	34.07	09	52	85.24
31-40	25	13.96	02	23	92.00
41-50	43	24.02	02	41	95.34
51-60	16	8.93	03	13	81.25
61-70	8	4.46	02	06	75.00
Control	15	8.37	15	00	00

**Table 2:-** Showing the Means of Age, BMI and smoking details

Age	Height Mean±SD	Weight Mean±SD	Gender Mean±SD M* F*	Body Mass Index Mean±SD	Smoker/ Non-Smoker Mean±SD
35.1± 11.7	1.626± 0.092	1.626± 0.092	113 66	23.54± 4.66	Nil

\*M-Male and F-Female

**Table 3:-** showing the Mean PFT parameters of FVC, FEV and Lung Age.

FVC -M Mean±SD	FVC (Pred) Mean±SD	% FVC Mean±SD	FEV-1(M) Mean±SD	FEV-1(P) Mean±SD	Lung Age(P) Mean±SD	Lung Age(M) Mean±SD
2.46±0.76	4.10± 2.82	63±13	2.62±0.94	3.29±0.65	35±12	48±20

## Discussion

The results obtained are suggestive of the group of persons under study are suffering from restrictive impairment as per the manual restrictive stage COPD as FEV1/FVC ≥ 70% and FEV1 < 80% was considered for evaluation. The average age groups of the persons under this study is 35 which indicate the subjects were not too old and in middle age. The BMI suggests that 23.54 suggestive of the group of persons were not in the category of obese. The Lung age seems to be the 10+ years older than that of the average age predicted for the Lungs i.e 35 indicating the affected lungs. The Forced Vital Capacity was just lesser than the normal of the whole group when compared with the predicted one indicating that major numbers of persons under study were suffering from COPD. The group has maximum percentage of the 31-40 years age group. The quiet young aged groups too have more Lung age as measured by the instrument Helios 401. All the subjects under the present study and control are non-smoker thus occurrences of Restrictive



Fig. 1: The Helios 401 Spirometer

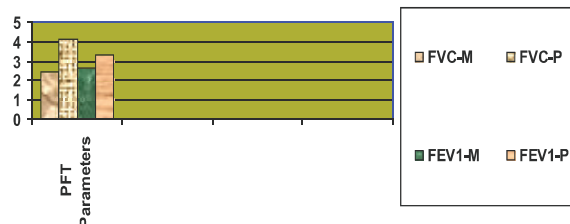


Fig. 2: PFT Parameters FVC and FEV1-P and M

Impairments through cause of smoking can not be considerable. In the age groups of 31-40 and 41-50 were the Percent of Restrictive Impairments were quite high i.e 92 and 95 percentage respectively. In a restrictive lung disease, the size of the lung is reduced, which increases the stiffness of the lung and limits its expansion. In these cases, a greater pressure (P) than normal is required to give the same increase in volume (V). Common causes of decreased lung compliance are pulmonary fibrosis, pneumonia and pulmonary edema. (<http://www.ugr.es>)

### Conclusion

The Lungs related diseases like Restrictive Impairment slowly increasing in the society. It is depending on the quality of air inhaled, working profile, diet, exercise and many more factors. The present study showcased that when the population under study has normal levels of the BMI they suffered from older lungs and decreased FVC and FEV1. The study also showed that the FVC readings are more on abnormal side as compared to that of the FEV1. The Figure 2 depicted that the Predicted FEV1 and FVC are higher and the measured is lower. This shows that the majority of the subjects under study suffering from COPD. The dust level of the area where population residing can be a factor to be taken into consideration as one of the recent news also shown that Air Quality Index (AQI) measured in Jaipur was at 383 (very poor), a notch below the

highest category of 'severe' which is far above than the desired level of 100 AQI. The desired level of AQI is 100. During this hazardous situation the peoples became more prone to heart or lung diseases. (<https://timesofindia.indiatimes.com>, 2018)

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International Journal of Neurology and Neurosurgery	2	10500	10000	820	781
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Journal of Social Welfare and Management	3	7500	7000	586	547
New Indian Journal of Surgery	4	8000	7500	625	586
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