



## EFFECT OF HEAVY SMOKING ON PULMONARY FUNCTION FOR PROFESSIONAL AIR CONDITIONER AND NON- AIR CONDITIONER USERS

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### ABSTRACT

**Background:** The cigarette smoking has extensive effect on respiratory function so the risk of respiratory mortality / morbidity is high with smoking. Pulmonary function in young healthy air conditioner (AC) users have 25-75% of vital capacity reduced between the FEF and PEF. **Objectives:** 1. To find out the pulmonary function of professional Air Conditioner users with heavy smoking. 2. To find out the pulmonary function of non-air conditioner with heavy smoking. 3. To compare the pulmonary function for professional Air Conditioner and non-air conditioner users with heavy smoking. **Methodology: setting:** AV modular furniture (India private limit). **study design:** observational study. **Materials & methods:** The pulmonary function tests were assessed on Peak flow meter, Spirometer & Pulse oximeter in 80 subjects (40-AC smokers & 40 - non - AC smokers) and results were compared. **Result:** The mean values for AC smokers PEF - 383.13, Inspiratory capacity - 4562.50, SPO<sub>2</sub> - 95.08 pulmonary function levels were significantly reduced than non-AC smokers. **Conclusion :** The mean PEF, Inspiratory capacity & SPO<sub>2</sub> were lower in AC smokers.

### KEY WORDS

Air Conditioner, smokers, Pulmonary function tests, Peak flow meter, Spirometer & Pulse oximeter.

### INTRODUCTION:

Over 5 million people are killed annually due to smoking. As reported by the 'WHO', by 20th century 100 million people were died and is predicted that by the end of 21st century more than 1 million people will be the victims of smoking<sup>(4)</sup>. It has firm roots over the rural and urban provinces of India in the form of bidis, pipes, cigar etc. <sup>(6)</sup> Consumed mainly in the form of bidis (54%), smokeless tobacco (27%), and cigarettes (9%) <sup>(6)</sup>. The major constituents of cigarette named nicotine can cause arteriosclerosis, coronary artery disease, COPD etc<sup>(11)</sup>. Basic respiratory functions are extensively affected and causes chronic bronchitis, emphysema, bronchial carcinoma <sup>(1,6)</sup>. Pulmonary functions are also damaged due to smoking and lead to oxygen insufficiency in cells as a result of elevated carbon

monoxide in the blood and decrease the oxygen carrying capacity of hemoglobin <sup>(12)</sup>.

Considerable evidence has been obtained that the neutrophils are important in mediating lung damage due to smoking. It has been observed that the circulating leucocyte counts and broncho alveolar lavage(BAL) neutrophil counts are much higher in the current smokers as compared to the ex-smokers/non-smokers and there is an inverse correlation between circulating leucocyte count and one second forced expiratory volume(FEV1) and forced vital capacity(FVC). The experimental studies carried out in hamsters came to a conclusion that even four hours of exposure to cigarette smoke causes extensive recruitment of leucocytes in to the airway walls. In

healthy smokers the increased in vitro elastase activity has been seen in cell free BAL fluid<sup>(18)</sup>.

AC is a device that is using to provide cooling indoor by condensation the atmospheric water vapour and thus reducing the humidity of air<sup>(9)</sup>. AC's are used extensively these days Indoor as well as while travelling. Over expose / inhalation of cold dry air an ultimately lead to alteration in the pulmonary function. Increased prevalence of IgE induce sensitization and hyper sensitivity pneumonitis are reported in the person exposed to aerosols of contaminated AC<sup>(10)</sup>. Mucous membrane irritation, breathing difficulties, irritated skin and constitutional or neurological symptoms such as head ache and fatigue are complaints faced by most of the AC users<sup>(9)</sup>.

Various studies conducted by a team of doctors from Indian Medical Colleges has come to a conclusion that people, who are over exposed to air-conditioned spaces are more likely to have respiratory ailments like coughing, wheezing and breathlessness, and the frequency of such disease are high among them. Surveys conducted by several international and Indian agencies have brought out the ill effects of excessive use of AC on humans.

Studies were conducted by 'Mendel' with the US department of energy's Lawrence Berkeley National Laboratory. On the health effects of air conditioning systems. They came to a conclusion that worsening asthma problems and allergies are the two-health issue that can stem from contaminated AC units.

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**METHODOLOGY:**

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- Sample size: 80
- Study location: AV modular furniture (India private limit )
- Study duration: single time study
- Study design: observational study
- Study sampling: purposive sampling
- Study type: comparative study

**INCLUSION CRITERIA:**

- Age: 20 to 30 years
- Gender: male only
- Condition: AC and Non- AC smokers
- Number of smoking: More than 200(cigarettes /bidis) per year.

**EXCLUSION CRITERIA:**

- History of acute or chronic respiratory disorders
- History of Cardiac disease

- The patient who all are undergoing medication for any cardiac or respiratory problem
- Regularly exercising individual
- Chronic alcoholic.

**TOOLS:****PULSEOXIMETER:**

A Pulse oximeter is a non-invasive device that estimates the amount of oxygen in blood. It does so by sending infrared light into capillaries in fingers, toe or earlobe.

**PEAK FLOW METER**

A peak flow meter is an inexpensive portable, hand held device, it used to measure maximum speed of expiration.

**SPIROMETER:**

A spirometer is an apparatus for measuring the volume of air inspired and expired by the lungs.

**OUTCOME MEASURES**

- Oxygen saturation level
- Peak expiratory flow rate
- Inspiratory capacity

**PROCEDURE:**

Totally 100 subjects were screened by means of questionnaire. Out of which 80 subjects were included in the study according to inclusion and exclusion criteria. After getting informed consent, they were divided into two groups according their experience.

First the personal data will be taken with include age, gender, history of smoking, weight and height. The participants were divided into two groups. Group A and Group B each consisting of 40subjects. Group A – smoker who did not use AC, Group B – smoker who had used AC (air conditioner. Both groups were assessed of their respiratory parameters, they are included Peak Expiratory Flow Rate (PEFR), inspiratory capacity and saturation level and data were collected, tabulated and analyzed statistically for evaluating the respiratory function.

**PEAKEXPATORY FLOW RATE:**

The subjects were asked to sit comfortably on chair(erect position).The complete procedure was explained the subjects were instructed to breath in fully and deeply inspiration with nostrils closed,seal the lips around the sterile mouth piece of peak flow meter and forcefully expire the air out as fast and as far as possible(they asked to do 2-3 times repeatedly) and then the maximum level will be recorded.

**INSPIRATORY VITAL CAPACITY:**

The subjects were asked to sit comfortably on chair (erect position). The complete procedure was explained. The subjects were asked to inspire through the mouthpiece as much as possible (they asked to do 2-3 times repeatedly) and then the maximum reading was recorded.

**OXYGEN SATURATION LEVEL:**

The subjects were asked to sit in a comfortable position (erect position). A clip like device will be placed on finger. Within 5 to 10 seconds the oxygen saturation level will be monitored and then reading will be recorded.

**STATISTICAL ANALYSIS:**

Statistical analysis was done by using the single t test. The significance was drawn at a P(probability) value of 0.05. The outcome of pulmonary function tests were presented as a mean  $\pm$  standard error of difference for each of the parameter. The two groups were compared by applying single t test and P value of less than 0.05 (\*P < 0.05) was considered as significant.

T test is often called student's t test in the name of its founder "student". T test is used to compare two different sets of values. It is generally performed on a

small set of data. T test is generally applied to two normal distributions which have a small set of values. This test compares the mean of two samples. T test uses means and standard deviation of two samples to make a comparison. The formula for T test is given below:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{s^2 \left( \frac{1}{n_1} + \frac{1}{n_2} \right)}}$$

Where,

x1 = Mean of first set of values

x2 = Mean of second set of values

S1 = Standard deviation of first set of values

S2 = Standard deviation of second set of values

n1 = Total number of values in first set

n2 = Total number of values in second set

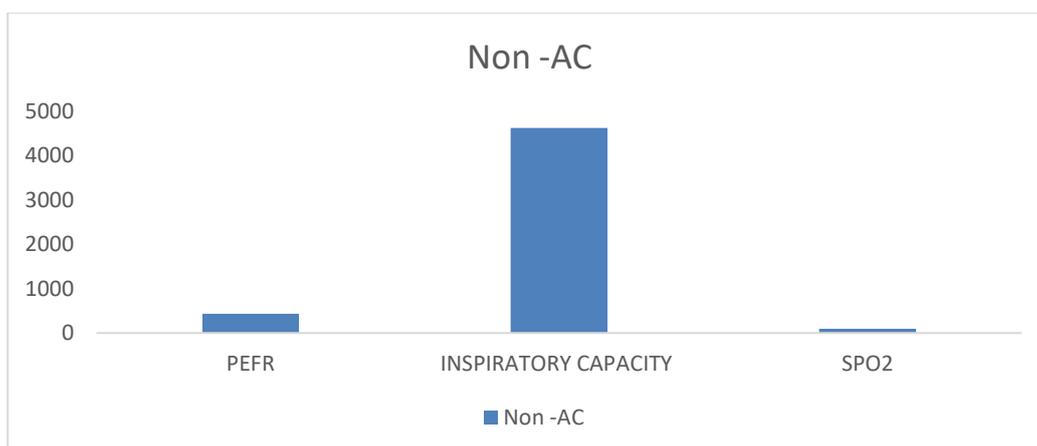
The standard deviation of a sample is known as S and is calculated using:

$$s = \sqrt{\frac{\sum (x - \bar{x})^2}{n - 1}}$$

P value < 0.05 was taken as a level of significance.

**TABLE 1: GROUP A  
SMOKING WITH NON-AC USERS (GROUP A)**

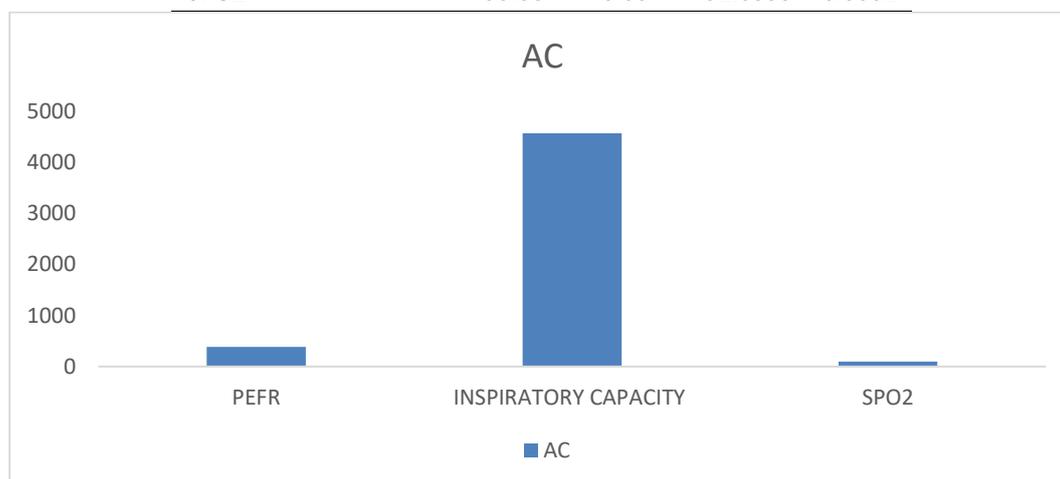
| LUNG PARAMETERS  | MEAN    | SD     | T        | P      |
|------------------|---------|--------|----------|--------|
| PEFR             | 434.00  | 59.82  | 45.8851  | 0.0001 |
| INSPIRATORY RATE | 4620.00 | 443.88 | 65.8280  | 0.0001 |
| SPO2             | 96.45   | 4.70   | 129.9094 | 0.0001 |



**GRAPH-1 SHOWS PEFR, INSPIRATORY CAPACITY, SPO<sub>2</sub> LEVEL OF SMOKING WITH NON-AC USERS (GROUP A)**

**TABLE 2: GROUP B  
SMOKING WITH AC USERS (GROUP B)**

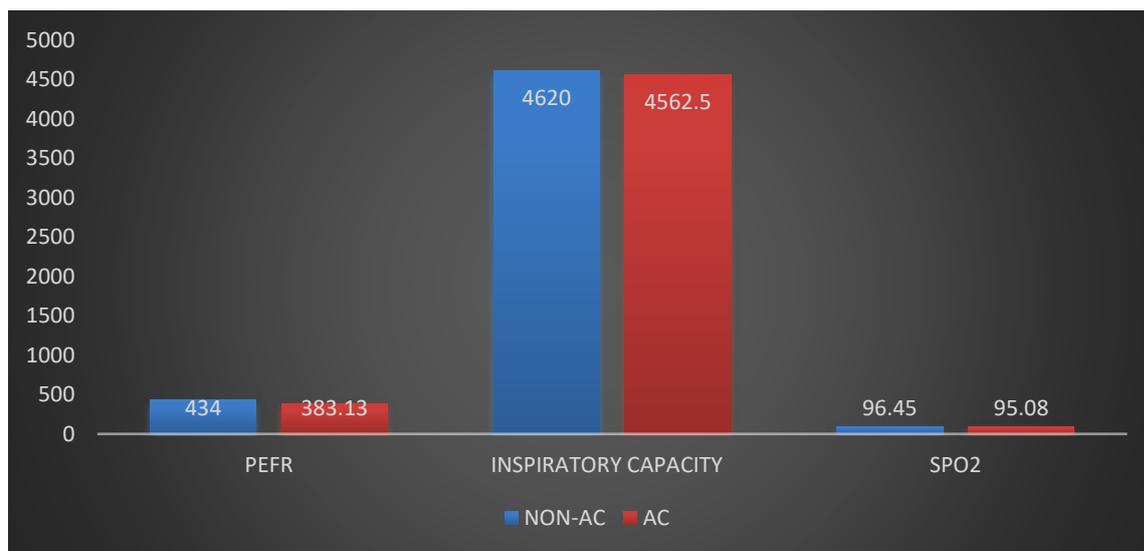
| LUNG PARAMETERS | MEAN    | SD     | T       | P      |
|-----------------|---------|--------|---------|--------|
| PEFR            | 383.13  | 83.27  | 29.0986 | 0.0001 |
| INSPIRATORY     | 4562.50 | 642.39 | 44.9197 | 0.0001 |
| SPO2            | 95.08   | 6.60   | 91.0553 | 0.0001 |



**GRAPH-2 SHOWS PEFR, INSPIRATORY CAPACITY, SPO<sub>2</sub> LEVEL OF SMOKING WITH AC USERS (GROUP B)**

**TABLE 3: COMPARISON BETWEEN GROUP A AND B**

| LUNG PARAMETERS | SMOKERS WITH NON-AC USERS (GROUP A)<br>MEAN VALUE | SMOKERS WITH AC USERS (GROUP B)<br>MEAN VALUE |
|-----------------|---------------------------------------------------|-----------------------------------------------|
| PEFR            | 434.00                                            | 383.13                                        |
| INSPIRATORY     | 4620.00                                           | 4562.00                                       |
| SPO2            | 96.45                                             | 95.08                                         |



**GRAPH-3 SHOWS PEFR, INSPIRATORY CAPACITY, SPO<sub>2</sub> LEVEL OF BOTH NON-AC SMOKERS AND AC SMOKERS**

#### RESULT:

Table 1 shows that Group A (Non-AC smokers) mean value  $\pm$  standard error of difference of PEFR ( $434.00 \pm 9.46$ ), inspiratory rate ( $4620.00 \pm 70.18$ ) and SPO<sub>2</sub> ( $96.45 \pm 0.74$ ) is significant. Table 2 shows that Group B (AC smokers) mean value  $\pm$  standard error of difference of PEFR ( $383.13 \pm 13.17$ ), inspiratory capacity ( $4562.50 \pm 101.57$ ), SPO<sub>2</sub> ( $95.08 \pm 1.04$ ) is significant. AC smokers mean value (PEFR-383.13, Inspiratory capacity-4562.50, SPO<sub>2</sub>-1.04) than Non-AC smokers (PEFR-434.00, Inspiratory capacity-4620.00, SPO<sub>2</sub>-96.45)

#### DISCUSSION:

This study is focused to see the changes occur between effect of heavy smoking on pulmonary function for professional Air Conditioner and non-air conditioner users. The result of the current study the mean values of the spirometry variables were found to be higher in non AC smokers than AC smokers and also the difference in PEFR was significantly higher in the non AC smokers.

Drawback of this study is that the fall in PEFR indicates obstructive lung changes and fall in FVC indicates restrictive lung changes. Smoking and intensive use of AC "s appeared to be positively related to atopic sensitization and enhanced eosinophil activity. As we see the P-value of group A and group B in different pulmonary function test.

Hence group A which shows effective significance for all the tests. The way of test and the comfort which gave them a better improvement and made changes in their

professional life. Study by keele CA et al, PEFR depends on the expiratory efforts exerted during forceful expiration as well as status of airway, And it reflects mainly the caliber of the bronchi and larger bronchioles . which are subjected to reflex broncho constrictions.

#### RECOMMENDATION:

1. Sample size can be increased.
2. Using of more parameters should be useful in future study like humidity level, culture swap from AC to know the growth of bacteria and fungi .
3. Female can also be included.
4. AC users might do pulmonary function tests regularly to detect any changes at an earlier stage.
5. Use advance techniques like computerized spirometer.
6. Age groups can be changed.

#### LIMITATION:

1. Less sample sizes
2. Less parameters used
3. Only males included

#### CONCLUSION:

Smoking in any form, bidi/cigarette affects the pulmonary function. Pulmonary function plays a vital role for the survival of human being. If pulmonary function is affected oxygen demand will be increased. It may lead to several health issues.

This study concludes, pulmonary function parameters like PEFR, Inspiratory capacity, SPO<sub>2</sub> levels were markedly reduced for both groups. But comparatively

Group B (ie) AC smokers pulmonary functions was much reduced than non-AC smokers.

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