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Influence of Aging on Lung Functions in Elderly Male and Female Healthy Subjects

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Abstract

Objective: This study helps to find out the significant changes of lung functions in case of male and female subjects with advancing age. **Material and Methods**: The present study was undertaken on elderly 65 years and above healthy, non smoker subjects of both sexes. Subjects were selected randomly from Puran Hospital OPD at Medicine Department Ponta Sahib,H.P and MMIMSRHospital,Mullana, Ambala,Haryana.The cross sectional study was conducted on 1000 subjects with equal number of male and female. The mean age of male was 74.46 ± 8.41 and mean age of female was 73.59 ± 8.32. We have taken healthy and clinically fit subjects those who are 65 years and above.Pulmonary function test was conducted by measuring FVC, FEV_1 and FEV_1/FVC ratio by using comprised Spiro-excel (Helios 401, Medicaid system, Chandigarh).**Result:** There was no significant correlation of age with FEV_1, FVC and FEV_1/FVC. **Conclusion:** All three respiratory parameters did not correlate significantly with advancing age.

Keywords: Aging, Elderly, Pulmonary function test.

Introduction

Physiological decline in multiple systems in older adults is a new field of geriatric research. Pulmonary function test is one of the basic and essential tests for diagnosis and assessment of pulmonary diseases such as pulmonary dysfunction, chronic obstructive pulmonary diseases (COPD) and asthma.

Ageing process is associated with progressive constriction of the homeostatic reserve of every organ. The most important physiological changes associated with aging are of respiratory system depicting the decrease in static elastic recoil of the lungs, in respiratory muscle performance, and in compliance of the chest wall and respiratory system, resulting in increased work of breathing[1]

Vital capacity is regulated by various number of factors such as sex, age, body weight,physical training,life style,climate and so many socio economic status and living conditions. Chronic Obstructive Pulmonary Disease (COPD) remains a major public health problem and is projected to fifth rank in global disease burden by 2020[2]

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There have been only a few studies to establish reference standard for pulmonary function with age, especially among Indian population. We are entering the 21st century with WHO (World Health Organisation), the concept "Health for all by 2000 A.D", but the older population is still ignored[3]

There are four basic changes that affect lung function as aging occurs. They are decrease in motor power, decrease in elastic recoil of lung tissue, stiffening of the chest wall, and decrease in the size of the inter-vertebral spaces[4]

With aging, the larger and more central airways increase in diameter as noted by an increase in anatomic and physiologic dead space[5]. Normally, older subjects have decreased ability to increase and maintain ventilation at high levels during periods of increased demand for oxygen[6].Ventilatory muscle fatigue is quite likely to occur early due to the altered physiology of voluntary muscle[7]. Older patients have a reduced cardiac index[8] and a reduced ability to increase heart rate under such circumstances[9]

The aim of this study was to establish Spirometric values for normal, healthy and non-smoker elderly male and female population aged 65 and above.

Material and Methods

The present study was undertaken on elderly 65 years and above healthy, non-smoker subjects of both male and female. Subjects were selected randomly from Puran Hospital OPD at Medicine Department. Paonta Sahib, H.P. and MMIMSR Hospital, Mullana, Ambala, Haryana.

Pulmonary function test was conducted by measuring FVC, $FEV_1$and FEV_1/FVC ratio by using computerized Spiro-excel (Helios 401, Medicaid system, Chandigarh). The cross sectional study was conducted on 500 male and 500 female elderly equally healthy subjects, those who were 65 years and above age. A written informed consent was obtained.

Inclusion Criteria

1) Non-smoker
2) Healthy individual without athletic training
3) Aged population 65 years and above but clinically fit.

Exclusion Criteria

1) All the 65 years and above with sign and symptoms of disease, on medication but clinically not healthy.
2) Smokers
3) Subjects having abnormalities of bronchial asthma, common cold, chronic bronchitis, pulmonary TB, oedema was excluded.

Ethical Consideration

- The proposal has been approved by IEC-MMU on 8/04/2015

Results

The data was analysed by using SPSS version 20.0 for windows. Mean and standard deviation (SD) was calculated and reported for quantitative variables. The Spearman correlation coefficient was calculated of lung function parameters FEV_1, FVC, FEV_1/FVC ratio. A p-value of <0.01 was considered statistically highly significant, value <0.05 was considered statistically significant and that >0.05 was considered statistically non-significant.

The result shows:

(1). The mean value of FEV_1in male 2.04 ± 0.59 and in female 1.85 ± 0.68.

(2).The mean value of FVC in male 2.39 ± 0.66 and female 2.27 ± 0.87.

(3) The mean value of FEV_1/FVC ratio in male 84.93 ± 10.4 and in female 84.26 ±8.57.

There is positive correlation found in between age and FEV_1, FVC but, FEV_1/FVC ratio with age is negatively correlated. All the three respiratory parameters didn't correlate significantly with age.

Descriptive statistics: Table-1 shows Age and Statistics and Table 2 shows Correlation of Age With Respiratory Parameters.

Table 1: Age and Statistics

AGE	MEAN & SD
FEV_1	1.94 ± 0.59
FVC	2.31 ± 0.73
FEV_1/FVC	84.61 ± 9.57

Table 2: shows Correlation of Age With Respiratory Parameters

AGE	PEARSON CORRELATION	P-VALUE
FEV_1	0.004	0.900
FVC	0.005	0.866
FEV_1/FVC	-0.018	0.571

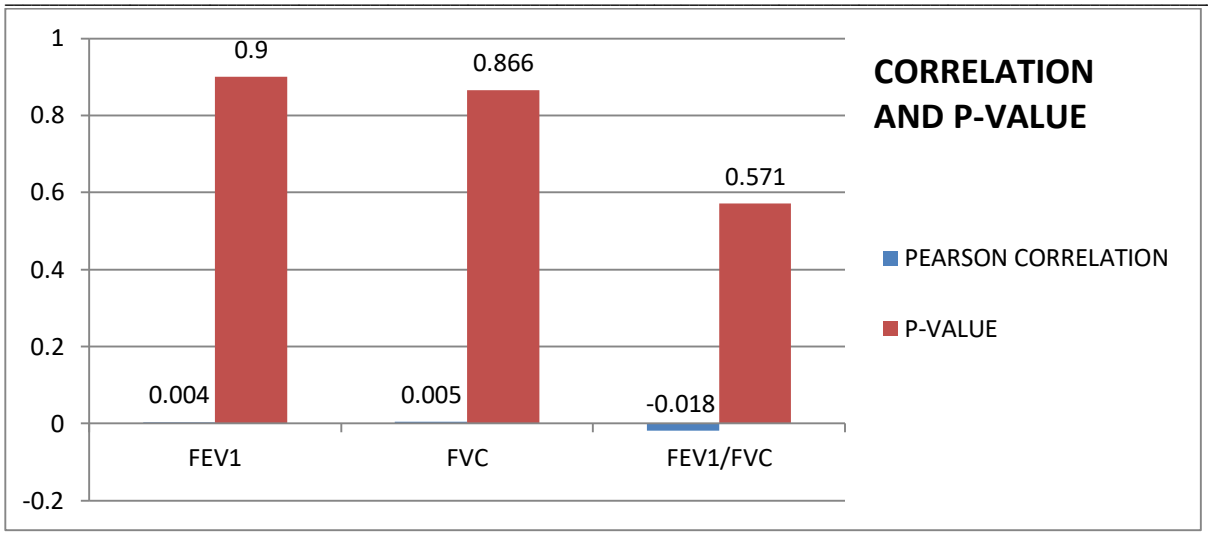

Figure 1: Shows Correction and Age with Respiratory Parameters

Discussion

Aging is a progressive failure of body's homeostatic adaptive response resulting in increased vulnerability to environmental stress and disease. The physiological sign of aging are gradual deterioration in function and capacity to respond to environmental stress. Aging is a general physiological on-going process and despite intensive research the mechanism of aging are still to be explored[10]

In this study a positive correlation was found between respiratory parameters FEV_1, FVC with age, whereas FEV_1/FVC ratio is negatively correlated with age. These findings are similar to those of Milne JS, Williamson J. et.al [11].According to their study there was no age related decline in FEV_1 or FVC among men, and only a slight decline among women occurs.

These finding is different from those of Burr et.al[12].They described that environmental factors such as smoking and air pollution affect lung function, and differences in exposure to such factors may contribute to differences in Spiro metric values.

Our study is also similar with a study conducted by Woo J, Pang J. et al. those who reported that there was no age related decline in FVC and FEV_1 in males aged 60 years and above[13]

The opposite aspect of study by Bala S, Dhar RJK and Sachdev S. et al found a positive correlation between all the (FVC,FEV_1,FEV3,PEFR)parameters with age and height in male and female subjects. Similarly, Krishna et.al found positive correlation of FVC,FEV_1,with age ,height and BMI[14].

Other study by Mrunal S. Phatak, Geeta A. Kurhade. et.al [15]also shows that the correlation of vital capacity with age was highly significant in case of both male and female whereas the correlation with height, weight and BSA not significant.

J.Pathak and P.P Mehrotra et.al (1989) in their study "Pulmonary functions of elderly Indian subjects "concluded a declining pattern of vital capacity with age but the decline was not uniform[16]

Conclusion

The outcome of present study indicates that FEV_1 and FVC are positively correlated and FEV_1/FVC ratio is negatively correlated with age. The study revealed that there is no significant correlation of FVE_1, FVC, FEV_1/FVC ratio with age. It indicates that lung function parameters were dependent on number of factors. The results obtained have both clinical and public health significance for evaluating the changes due to aging.

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