

Study of Pulmonary Function Test in Asthma Patients

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Abstract

Background

Spirometry is an objective and reproducible test of lung function. It measures how quickly full lungs can be emptied and the total volume of air expired. The most important measurements obtained from the spirometry test are FEV1. The FEV1 is the volume expired in the first second of maximal expiration initiated at full inspiration, and is one measure of airway calibre. FVC is the maximum volume of air that can be expired during the test. Asthma is a complex, recurrent disease of the airways that causes shortness of breath, wheezing, and cough. In the present study conducted for observation of pulmonary function tests in asthma patients.

Materials and Methods

The present study conducted in different hospitals from India, total 500 asthma patients are participated in this study and same number of healthy controls also involved, the subjects age was range of 20 to 70+ years.

Results

The findings of present study found that the all the pulmonaryly function test parameters are shown the less values than controls.

Conclusion

The present study results are concluded that asthma patients showing slower lung function tests values compared to control normal healthy of same age, the knowledge of this study helpful in treatment of asthma in different age groups.

Key words – Bronchial Asthma, Spirometry, FEV1, FVC.

INTRODUCTION

Asthma is a complex, recurrent disease of the airways that causes shortness of breath, wheezing, and cough. Asthma is episodic in nature and usually reversible, either spontaneously or with treatment. However, chronic inflammation, associated with persistent symptoms, may contribute to airway remodelling that may not be completely reversible. Airflow limitation occurs as a result of varying degrees of airway hyper responsiveness, airway edema, and bronchoconstriction. In Bronchial Asthma the airway resistance is increased due to inflammatory allergic and psychological factors. Bronchial asthma is a large economic burden i.e. 12.7 billion dollar globally. Bronchial asthma is the most common cause of missed school days in children i.e. 10.2 million & 3 million missed working days for adults annually. Bronchial asthma besides being a chronic inflammatory disease of the airways also has psychosomatic imbalance and an increased vagal tone as its etiopathogenesis[1,2].

Spirometers are noninvasive diagnostic instruments for screening and basic testing of pulmonary function. Offering essential diagnostic insight into the type and extent of lung function impairment, spirometry tests can be performed fast at fairly low cost. In the light

of an ever-increasing prevalence of airway diseases such as asthma, bronchitis, and emphysema, pulmonary function instruments have become indispensable diagnostic tools, in clinical and office settings, in industrial and preventive medicine, as well as in epidemiology.

Screening of individuals at risk, basic testing of sick patients, and treatment follow-up are key applications of spirometry. Two essential questions of pulmonary function testing (PF testing) can be answered by spirometry, What is the size of lung volume which can be inspired *or* expired?, What is the time it takes to exhale this volume, or what is the flow rate during exhalation?. Flow rates and resulting volumes are measured by connecting a spirometry sensor through a mouthpiece to the test subject's mouth. The most common and internationally standardized test consists of an evaluation of forced expiration after a complete inhalation, allowing the determination of forced vital capacity (FVC) and the forced expired volume during the first second (FEV1). Spirometry is also helpful in making a diagnosis in patients with breathlessness and other respiratory symptoms and for screening in occupational environments. Although the use of spirometers in primary care is increasing, in some countries uptake is still low. In those countries where spirometry is in more common usage, there

are major concerns regarding the technical ability of operators to perform the test and interpret its results[3]. Bronchial asthma is a large economic burden i.e. 12.7 billion\$ globally. Bronchial asthma is most common cause of missed school days in children i.e. 10.2 million and 3 million missed working days for adults annually. Efficient and safe asthma control will not only reduce the economic burden but also side effects of drugs because it reduce the doses of drugs. Long -term deterioration of lung function in asthma patients has been studied in various studies. Previously it is believed that asthma is characterized by totally reversible airway obstruction. Because of so many studies now it is established that prolonged airway inflammation regulated by a variety of inflammatory cells and mediators is the central mechanism in the pathogenesis of asthma. Inflammation leads to injuries and repair including regeneration and replacement by connective tissue. It has been hypothesized that chronic airway inflammation can lead to airway remodelling and in the long term to irreversible airway obstruction. The consequence of this process could be deterioration in pulmonary function[4]. The present study is conducted to observe pulmonary function tests in normal and asthma patients.

MATERIALS AND METHODS

The present study conducted in different hospitals from India, total 500 asthma patients are participated in this study and same number of healthy controls also involved, the subjects age was range of 20 to 70+ years. The pulmonary function test values are recorded with help of spirometer, FVC and FEV1 are recorded for all the subjects. The patients and normal subjects are divided in to different age groups as 20-29, 30-39,40-49,50-59,60-69 and 70+ years.

RESULTS

The findings of present study found that the all the pulmonary function test parameters are shown the less values than controls[Table no – 1,2,3,4]. The mean and SD values of forced vital capacity of male and female asthma patients of different age groups decreased when age is increased. The controls of male and females were not shown any significance[Table no – 1,2], The mean values of Forced expiratory volume[FEV1] is decreased when age is increased in both male and female asthma patients[Table no – 3,4].

Table 1: Forced vital capacity – Mean±SD of Male controls and Patients.

Age groups(years)	Male	
	Control(Normal Healthy)	Asthma Patients
20-29	102.69±12.23	96.76±17.22
30-39	102.16±13.69	93.17±22.37
40-49	100.16±21.67	86.07±23.18
50-59	101.16±15.13	82.93±25.62
60-69	100.06±30.57	80.72±21.06
70+	100.77±26.72	74.11±28.26

Table 2: Forced vital capacity – Mean±SD of Female controls and Patients.

Age groups(years)	Female	
	Control(Normal Healthy)	Asthma Patients
20-29	107.66±15.07	91.32±23.12
30-39	95.76±20.19	92.16±18.76
40-49	97.06±27.29	89.06±18.81
50-59	106.66±29.01	81.92±27.51
60-69	89.62±23.76	76.32±26.01
70+	96.03±30.45	70.28±32.09

Table 3: Mean±SD of Forced expiratory volume in first second -FEV1 in male bronchial asthma and control.

Age groups(years)	Female	
	Control(Normal Healthy)	Asthma Patients
20-29	92.60±14.15	79.12±27.19
30-39	95.72±13.15	72.70±20.27
40-49	98.21±22.12	63.10±26.02
50-59	90.12±18.06	56.01±24.89
60-69	86.27±27.14	53.12±27.14
70+	101.03±22.62	51.26±23.44

Table 4: Mean±SD of Forced expiratory volume in first second -FEV1 in Female bronchial asthma and control.

Age groups(years)	Female	
	Control(Normal Healthy)	Asthma Patients
20-29	106.72±17.22	76.21±27.19
30-39	100.23±15.78	66.16±25.33
40-49	96.99±19.06	69.77±24.56
50-59	93.87±31.22	72.91±26.46
60-69	99.63±20.95	58.84±25.11
70+	96.78±33.87	58.69±31.73

DISCUSSION

The present study results shows that decrease of FVC and FEV1 values in all the age groups asthma patients and there is no much difference in FVC and FEV1 values in controls with different age groups. This results shows that asthma is causing the damage of fibrotic tissue of lung and causing the decrease lung function when age is increasing and it is causing the irreversible fibrotic tissue change resulting the decrease in lung functions.

Our results are in agreement with Madan study[5] observed that decreased FEV1 in people with asthma. The study of Fletcher [6] reported that mean unadjusted decline in FEV1 of 22ml. per year greater in men with asthma than in men without asthma. The studies of Ulrik et al[7] and Lange et al[8] suggested that asthma as a significant impact on lung function decline. The study of Burrows et al[9] observed that declines in FEV1 of less than 5 ml in adults with asthma. Panhuysen et al[10] study reported about 25-year follow-up data on adults from a Dutch asthma clinic, more than 75 percent of the patients had FEV1 values below 90 percent of the predicted values at the final examination. Zeiger et al[11] the unadjusted annual decline was 80.1 ml. per year of asthma duration for FEV1 and 20.5 ml. per year for FVC in the whole study group. Peat et al[12]observed that mean loss of FEV1 in male non-smokers suffering from asthma of about 50 ml .year compared with 35 ml./year in normal subjects. In some previous studies observed that a reduction in ventilatory function leads to an increased mortality among asthmatic subjects[13,14]. The present study reported that mean values and comparison of FVC of male and female patients and controls. In patients FVC values are decreased that when age is in increasing. In control male and female the mean values are not changed significantly. In controls FVC values not decreased when age is increasing. Our results are in agreement with Madan Study[5]. The knowledge of this study results help in treating of asthma.

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