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Original Research Paper

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CORRELATION OF AGE, GENDER AND BMI ON SPIROMETRIC PARAMETERS IN ASTHMA PATIENTS

Sajitha G R	Associate Professor, Department of Biochemistry, DrSMCSI MCH, Trivandrum, India.
Deepa. D*	PhD Scholar, Department of Physiology, National Institute of Medical Sciences and Research, NIMS University, India.*Corresponding Author
Kumari Indira KS	HOD, Department of Respiratory Medicine, SNIMS, Chalakka, Kerala, India.
Usha Gupta	Em. Professor, Department of Physiology, NIMS University, Jaipur, India.

ABSTRACT Asthma becomes a common respiratory condition across the world irrespective of development. Spirometry is an effective tool for risk prediction, asthma intervention and prevention of sudden attacks. It was a retrospective analysis of 40 asthmatic subjects who attended the Pulmonary medicine Department. The sample size was comprised of 22 females and 18males. Age, sex, BMI and spirometric parameters (FVC, FEV1, FEV1/FVC%, FEF25-75) were collected from patients' medical records. This study presented a significant negative correlation of FVC, FEV1 and FEF25-75 with age, but no significant correlation between age with FEV1/FVC. There was no significant correlation between BMI and above spirometric parameters. Mean FVC, mean FEV1 and mean FEF25-75 were lower in female patients than in male patients. However, the mean FEV1/FVC was higher in females than in male patients.Considering the association of the majority of pulmonary function test values with age and gender in asthma patients, spirometry will be a useful tool for the early detection of changes in pulmonary function in the normal population residing in urban or industrial areas and thereby adopt appropriate measures to maintain a healthy respiratory system. In short, spirometry will be a useful tool for the early detection of pulmonary changes before the appearance of symptoms.

KEYWORDS : Asthma, age, gender, BMI , spirometry

INTRODUCTION

Asthma is a chronic inflammatory disease of the airways with bronchospasm and reversible obstruction of airways[1]. The variable and recurring symptoms include wheezing, chest tightness, coughing, and shortness of breath[2]. Asthma is clinically classified depending on the frequency of symptoms, forced expiratory volume in 1 second(FEV_1), and peak expiratory flow rate[3]. It is considered that both genetic and environmental factors are involved in the development of asthma[4].

According to the reports of WHO, there are nearly 340 million sufferers of asthma worldwide in 2016. And low and middle-income countries contribute a major part of mortality related to asthma[5]. It presented a prevalence of 7 to 10% globally in all ages[6]. In India, the prevalence of asthma was 2%[7].

Asthma management, treatment decision and prevention are made based on the severity of the disease. Multiple characteristics, including measures of lung function, are incorporated in asthma severity classification [8]. Many previous studies gave a strong emphasis on the predictive capacity of spirometry for understanding the asthma risk in adults. Spirometry calculates the amount of air moving in and moving out of the lungs and at what speed it moves. The normal value of these tests depends on the age, gender and size of the person being tested.

Spirometry parameters assessed for this study were forced vital capacity (FVC), FEV_1, FEV_1/FVC%, forced expiratory flow between 25% and 75% of the FVC (FEF_{25-75}) %.

Considering the effectiveness of spirometry in asthma intervention, prevention of acute attacks and risk prediction, this study was designed to find out the correlation of demographic (age and gender) and body mass index (BMI)of asthmatic patients with physiological parameters obtained from spirogram.

MATERIALS AND METHODS

It was a retrospective data analysis performed in 40 asthmatic patients who have attended the Pulmonary medicine Department of one of the teaching institutes in Kochi.The sample size was comprised of 22 females and 18males. Age, sex, BMI and spirometric parameters (FVC, FEV_1, FEV_1/FVC%, FEF_{25-75}) were collected from patients' medical records.

Subjects were diagnosed by a pulmonologist as asthma depending on the clinical presentation of cough, dyspnoea and wheezing, which improved with the use of a bronchodilator.

The study was done based on the inclusion and exclusion criteria as below:-

Inclusion criteria: Asthmatic patients both male and female between 15 to 60 years of age who attended the pulmonary medicine department were included in the study.

Exclusion criteria:

Patients who had acute exacerbations, recent cardiac diseases and were too sick to undergo procedures of spirometry were excluded from the study.

BMI was determined from the measured height and weight as weight in kilograms divided by height in meters. Height was measured by a wall stadiometer in subjects without shoes; weight was measured by a digital scale. Spirometric parameters were obtained from a spirometer (Micro Quark, Cosmed, Rome), which was performed according to the guidelines of the American Thoracic Society.

All statistical analyses were performed using SPSS (version11) for windows software. Correlation analysis was performed computing Pearson's correlation coefficient of FVC, FEV_1, FEV_1/FVC%, FEF_{25-75} with age and BMI. The differences in the mean values of spirometric parameters between male and female patients were tested for its statistical significance by applying independent sample't'

test. A p-value of less than 0.05 wasconsidered statistically significant.

RESULTS

In the present study, 40 asthmatic subjects were included and data analyzed for correlation of spirometric parameters with gender, age and BMI.

The mean values, standard deviations and p values of study variables are shown in table1.

Table 1

Variable	Male	Female	P-Value
	Mean ±SD	Mean±SD	
Age	47.1±2.9	41.7±10.8	0.16
BMI (Kg/m^2)	24.9±4.6	25.2±3.24	0.79
FVC(litres)	2.7±0.49	1.80±0.51	<0.001
FEV_1(litres)	1.8±0.37	1.31±0.48	<0.001
FEV_1/FVC%	67.3±8.6	72.20±9.05	0.091
FEF_{25-75}%	1.29±0.395	1.03±0.52	0.089

Table 1 demonstrated mean FVC and FEV_1were significantly higher in male patients than in female patients. Mean $FEF_{25-75}$was found to be higher in male patients than in female patients, however, the difference was only borderline significant. Mean FEV_1/FVC was higher in female patients than in male patients.

Table 2: Correlation between age and above spirometric parameters

Spirometric parameters	Age	
	p-value	r- value
FVC	0.035	-0.334
FEV1	0.006	-0.425
FEV1/FVC	0.166	-0.223
FEF25-75	0.002	-0.470

Table 2 demonstrated

1) Significant negative correlation (mild) correlation between age and FVC.
2) Significant negative correlation (moderate) correlation between age and FEV_1.
3) No Significant correlation between age and FEV_1/FVC.
4) Significant negative correlation (moderate) correlation between age and FEF_{25-75}.

Table 3: Correlation between BMI and above spirometric parameters

Spirometric parameters	Body mass index	
	p-value	r-value
FVC	0.443	0.125
FEV1	0.251	0.186
FEV1/FVC	0.319	0.161
FEF25-75	0.276	0.176

Table 3 showed no significant correlation between BMI and above spirometric parameters

DISCUSSION

In the present study, spirometric parameters of asthma patients were correlated with age, gender and BMI. The study detected a significant negative correlation of FVC, FEV_1 and FEF_{25-75} with age, but no significant correlation between age with FEV_1/FVC. No significant correlation was found between BMI and above spirometric parameters. Mean FVC, mean FEV_1 and mean FEF_{25-75} were higher in male patients than in female patients. However,the mean FEV_1/FVC was higher in females than in male patients.

Similar to this study, Archana and Agarwal P (2019)[9] demonstrated lung function decline with age in a study of 60 asthmatic patients. Wu et al [10] found significant negative correlation of age with FVC (r= -0.446), FEV_1 (r= -0.495) and FEF_{25-75}in Chinese elderly subjects. A recent study of Shailesh K Singh and Prem P Dubey (2018)[10], the declining lung function with age was in agreement with this study.

In this study, age was not significantly correlated with FEV_1/FVC. However, Wu et al (1990)[11] found a significant negative correlation of age with FEV_1/FVC in male elderly subjects. Simone Accordini et al (2018)[12] found uncontrolled asthma subjects had a higher decline in FEV_1/FVC compared to controlled subjects. FVC determines total compliance from the lung and chest wall. In addition to the total compliance, airway resistance was reflected in FEV_1. In normal subjects, elasticity decreases as age advances which is reflected more on FEV_1 than FVC, causing decrease in FEV_1/FVC ratio[13].

Ghabashi and Iqbal (2006)[14], in line with this study, found BMI was not significantly correlated with spirometric measurements in a study which had conducted in Saudi Arabia. The present study was contrary to the findings of that to Santana H et al (2001)[15] who found associations of BMI with $FEV_1$and FVC.Thyagarajan B et al (2008)[13] had noticed in a longitudinal study of healthy young adults that an increase of BMI was associated with a decline of FEV_1 and FVC and more or less constant FEV_1/FVC. Large sample size will be of great value, as far as the above correlation with BMI is concerned.

As in normal, the mean of FVC ($p<0.01$), FEV_1($p<0.001$), FEF_{25-75} ($p=0.089$) were higher in males as compared to females in this study except the mean of FEV_1/FVC ($p = 0.091$) which was higher in females compared to male patients. Dijkstra et al (2006)[16] showed estrogen receptor 1 (ER) polymorphism was correlated with the decline of lung function especially in female patients with asthma. Rhodes L et al (2005) [17] reported prevalence of asthma was higher in females compared to males in the case of the general population.Contrasting findings were reported the role of testosterone in the development of inflammation and hyperresponsiveness of airways[18].

Considering the association of the majority of pulmonary function test values with age and gender in asthma patients, spirometry will be a useful tool for the early detection of changes in pulmonary function in the normal population residing urban or industrial areas and thereby adopt appropriate measures to maintain a healthy respiratory system.

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