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Original Article

Evaluation of the Correlation Between Body Mass Index and the Severity of Asthma in Recently Diagnosed Patients

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Abstract:

Introduction:
Asthma and obesity are among diseases that cause several problems and impair quality of life. The concurrence of these diseases, changes in the respiratory physiology, changes associated with obesity and limited activity associated with asthma may cause an interaction between the two conditions.

Materials and Methods:
We studied the epidemiologic characteristics of all recently diagnosed cases of asthma with no previous treatment who visited the Respiratory Diseases Clinic of the Ghaem Hospital from 2004 to 2007, their Body Mass Indexes (BMI) were calculated and then spirometry was performed in all cases.

Results:
We studied 232 cases with the mean age of 38.96±12.94 years and the mean BMI of 27.05±4.92. Cough and exertional dyspnea were the most common clinical symptoms. In spirometric evaluations, the mean maximum mid-expiratory flow (MMEF) increased with weight, which was not, however, insignificant. FVC in obese patients was significantly less than in normal weight cases. A significant correlation was not also seen between BMI and FEV1 (r=-0.023, P=0.729).

Conclusion:
Except for FVC which had a significant correlation with BMI, other studied indices yielded no significant results, which calls for more extensive studies with larger populations. Considering the fact that mild asthma is less common in obese patients, better weight control in asthmatic patients can promote their quality of life and make asthma management more effective.

Keywords:
Asthma, Body mass index, Obesity, Spirometry

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Introduction

Asthma is one of the most common noncontagious diseases in human societies. This disease is reported to have an incidence of 5-10% in different societies. There are various genetic and environmental risk factors, the most important of which is a family history of atopy. Other risk factors include high and low birth weights, premature birth, smoking mothers, salty food and obesity (1).

Both asthma and obesity are chronic diseases with different features, exposing the individual to various social, economic, cultural and medical problems. Many risk factors have been identified for asthma attacks, and the relationship between changes in weight, especially obesity, and asthma has been proposed in view of the fact that there is an established relationship between BMI and decreased FEV1. Considering the ever-growing obesity even among youths and children, resulting from limited physical activity associated with industrial life and consumption of high-calorie food, However, it is not know which causes which, since changes in the respiratory physiology associated with obesity and reduced FVC are known to increase asthma, and, on the other hand, problems associated with asthma and increased asthma attacks during physical activity lead to limited activity in these patients, and hence their obesity.

In this study, we investigated the effects of weight change, in terms of BMI, and its relationship with spirometric findings in recently diagnosed asthma patients prior to any treatments.

Materials and Methods

This was a descriptive, analytical, cross-sectional study, investigating the relationship between BMI and asthma in patients visiting the Ghaem Hospital between September 2004 and September 2007. The diagnosis of asthma was based on clinical findings and the opening of obstructed airways as a 12+% increase in FEV1 after two puffs of salbutamol (2). Patients with a history of therapeutic treatment of respiratory symptoms, use of corticosteroids, and other respiratory, metabolic or endocrine conditions, and those who refused to regularly participate in spirometry were excluded from the study.

The research questionnaire was then completed, which included epidemiologic characteristics, height, weight, respiratory symptoms, and spirometric findings. spirometry was performed by an experienced technician using Fukuda-ST95 in all cases, and in each case, the best of the three tries was selected.

The severity of the disease was classified according to spirometric findings and the conventional classification, and patients were classified as those with mild intermittent, mild persistent, moderate persistent and severe persistent asthma. Upon collection of the data and the completion of the questionnaires, the data were coded and fed into the statistical software SPSS.

Patients' characteristics were achieved through descriptive analysis; the comparison of groups was performed using the independent t-test, analysis of variance and Chi-square test, and figures smaller than 0.05 were considered significant. Moreover, the correlation between FEV1 and BMI was assessed using the Pearson test.

Results

Overall, there were 232 patients in this study, 105 (45.3%) female and 127 (54.7%) male. The patients' mean age was 38.96±12.94.

Coughing was the most common clinical symptom, reported in 227 (97.4%) patients, followed by exertional dyspnea (93.1%), wheezing (21%), and non-exertional dyspnea (73.8%). And nocturnal dyspnea (21%).

Patients' mean height was 1.66±0.09m, and their mean weight was 74.93±14.38,

so the mean BMI was 27.05±4.92. In terms of BMI, 2.6% of patients were underweight, 33% were normal, 39.5% were overweight and 24.9% were obese.
The patients were then categorized into three groups based on their BMIs: patients of normal and less than normal weight (BMI<25), overweight patients (25<BMI<29.9), and obese patients (BMI>30), and the mean spirometric findings were compared in these three categories (Table 1).

Table 1: Mean spirometric indices in recently diagnosed asthma patients according to BMI levels

Mean±SD	Normal Weight or Less	Overweight	Obesity	P
FEV1(Lit)	2.32±0.69	2.07±0.63	2.220±0.66	0.102
FEV1 (%)	%64.9±13.39	%65.5±10.50	%67.1±11.36	0.451
FVC(Lit)	3.08±0.90	2.59±0.80	2.82±0.83	0.004
FVC(%)	%71.46±12.37	%69.44±10.96	%71.78±10.53	0.438
FEV1/FVC	%68.30±9.23	%70.11±8.74	%69.44±10.53	0.522
MMEF(%)	%47.83±16.56	%49.98±14.24	%50.95±15.61	0.411

Asthmatic severity was then classified based on spirometric findings, especially the FEV1, according to the classification scheme of National Asthma Education and Prevention Program (NAEPP).

Patients with an FEV1 of less than or equal to 60% of the expected level were placed in the severe asthma group, those with an FEV1 of between 60 and 80% of the expected level in the moderate group, and those with an FEV1 of more than or equal to 80% of the expected level in the mild group (Table 2). The comparison of asthma severity according to BMI levels and using the Chi-square test, there was no significant difference in different groups (P=0.710).

Table 2: Mean spirometric indices in recently diagnosed asthma patients according to BMI levels

Weight Group	Mild Asthma	Moderate Asthma	Severe Asthma
< Normal	(%16.7) 1	(%33.3) 2	(%50.0) 3
Normal	(%10.4) 8	(%59.7) 46	(%29.9) 23
Overweight	(%6.5) 6	(%70.7) 65	(%22.8) 21
Obese	(%5.2) 3	(%67.23) 39	(27.6) 16

While in the obese group mild asthma had the lowest incidence, but severe asthma was higher in less-than-normal weight group. An examination of the relationship between FEV1 (% pred) and BMI, no significant statistical correlation was observed (P=0.729, r=-0.023), yet there was an inverted correlation (fig 1). FEV1 (% pred) levels are shown in fig 2 based on BMI.

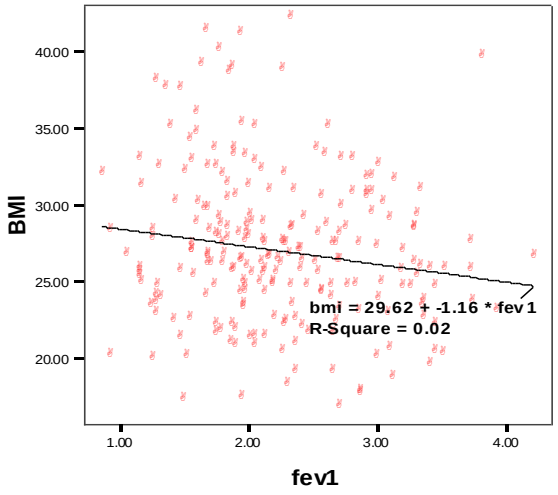

Fig 1: Scatterplot showing the changes of FEV1 (% pred) and BMI in patients

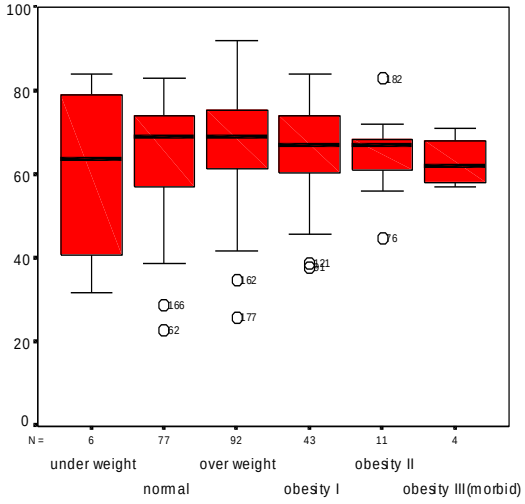

Fig 2: FEV1 (% pred) based on patients' BMI

Spirometric findings were also examined in our study in two age groups. Patients were classified into two groups: those younger than or 35 years old, and those over 35. There was no significant relationship between BMI and FEV1 in the two age groups, but the percentage of FVC was considerably higher in the younger group (*P*=0.002). There was also no significant relationship between BMI and FEV1 in different sexes.

Discussion

This study investigated the relationship between BMI and spirometric findings in asthma. Some studies have reported that obesity not only has a significant effect on the airflow and decreasing Functional Residual Capacity and impairs respiratory physiology (3), but also increases hypersensitivity and other allergic conditions in these patients (4). Obese patients has a lower response to treatment and asthma management is more difficult in these patients (5,6).

In a study conducted by Chen et al in Canada in 2006, the relationship between obesity and asthma and other allergic conditions in patients 20-64 years old was investigated, and every unit of BMI increase was found to increase the risk of asthma by 6% in women and by 3% in men (7). In different studies by Chen et al, Ostrowska-Nawarycz et al, and Cassol et al, the relationship between obesity and asthma in sex-related astudies was investigated, and the relationship was dominantly more marked in females (7,8,9).

General population statistics suggest that 25% of people are overweight, and that 25% are obese, and overall, 50% of people are overweight or obese (10). Our study, whose population consists of asthmatic patients, shows a higher incidence of obesity in asthmatic patients than in the general public. In a study conducted by Ghabashi et al in Saudi Arabia in 2066, the incidence of obesity in patients with a low FEV1 was reported to be approximately 60% (11).

Spirometric findings were studied, and were then compared according to BMI

levels. Patients were classified according to their BMIs into three categories: patients of normal or lower weight (BMI<25), overweight patients (25<BMI<29.9), and obese patients (BMI>30), and the mean spirometric findings were compared in these three groups.

The mean MMEF increased with weight, but there was no significant difference in these categories (P=0.411). FEV1, which is an important index in asthma, was lower in overweight and obese patients than in patients with normal or less than normal weights, yet there was no significant difference (P=0.451).

The examination of FVC yielded a significant difference in different groups: FVC was significantly lower in obese patients that in patients with normal weight. Decreased FVC has also been mentioned in reference books (12). The comparison of the mean FEV1/FVC ratio yielded no significant difference in different weight groups (P=0.522). Reference books also have it that FEV1/FVC ratio does not change with increased BMI, obesity or the hypoventilation associated with obesity (12).

The comparison of spirometric findings of the two sexes, there was no significant difference in FEV1 and FVC, but FEV1/FVC ratio was considerably higher in men. The comparison of the sexes in various studies has shown that obesity has a more marked aggravating effect in women (7-9), and in 2005, Chen et al reported in a study that a BMI of over 30 increases the severity of asthma especially in women (13).

a more marked aggravating effect in women (7-9), and in 2005, Chen et al reported in a study that a BMI of over 30 increases the severity of asthma especially in women (13).

However, our study did not show such a marked difference.

Finally, the severity of asthma was identified based on FEV1, and its correlation with BMI was studied; mild asthma was observed to be the least common in the obese group, and the severity of asthma was the highest. Nonetheless, the incidence of severe asthma was higher in less-than-normal weight patients. Thus, an abnormal BMI, and especially obesity, can lead to an increase in the severity of asthma. The relationship between BMI with obesity and its aggravating effect on the severity of asthma has been shown in other studies.

Since the study population was heterogeneous, the severity of asthma was also compared in different sexes and age groups. The results were fairly similar to those in the general population. Mild asthma had the highest incidence in men of normal weight, and in women of normal or less than normal weight. The incidence of severe asthma, however, was higher in obese women and underweight, overweight and obese men than in those of normal weight. There was also no significant difference in the two age groups.

The results of this study showed that the incidence of mild asthma is low in obese patients. Therefore, considering the fact that obesity is a risk factor in the severity of asthma, appropriate weight control can lead to improved quality of life and increased efficiency of therapeutic measures.

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