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THE EFFECT OF OBESITY ON ASTHMA SEVERITY AND ON POST-BRONCHODILATOR RESPONSE

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ABSTRACT

Background: In the past three decades, there has been a significant increase in the prevalence of both asthma and obesity worldwide. Previous studies have shown an association between obesity and asthma. However, the nature of the relationship between obesity and different asthma parameters like severity, control level, and frequency of inhalers use still controversial. **Objective**: The aim of this study to determine the effects of obesity, on severity of asthma and post-bronchodilator response. **Patients and method**: A cross-sectional study was conducted from March 2011 to March 2012 at Baghdad teaching hospital on (109) previously diagnosed asthmatic patients attended the respiratory clinic or attended emergency department with an acute attack. They underwent baseline PEFR that grades the severity into mild, moderate and severe attack and another PEFR measured after bronchodilator therapy in the form of salbutamol nebulizer, weight and height were measured for all study participant to determine body mass index (BMI), and accordingly the patients were divided into two groups obese and non- obese. Post-bronchodilator response defined by increase in the PEFR by (200 ml) or more recorded as either significant or poor response. **Results** : A total sample of 109 asthmatic patients were involved in the study ,of them 27 males and 82 females were distributed according to WHO classification of the (BMI) as follow: 53 patients were non-obese, and 56 patients were obese. Regarding the severity of asthmatic attack according to (PEFR), 55 patients had mild attack, 33 patients had moderate and 21 patients had severe attack. Regarding post bronchodilator response, it`s important to notice that 31 out of 56 obese asthmatic patients had poor response compared to 20 out of 53 normal and overweight asthmatic patients who show such responses. **Conclusions**: No significant effects of BMI on asthma severity but relatively significant weak inverse effect on post-bronchodilator response.

KEYWORDS: Effect, Obesity, Asthma Attack Severity, Post-bronchodilator response.

INTRODUCTION

Obesity and asthma

There is some evidence that weight loss in obese asthmatic patients is associated with improved symptoms and lung function, especially PEFR variability.[1] More than 30 cross-sectional and case-control studies of the relationship between obesity and asthma have appeared since the 1990s. Almost without exception, these studies report an increased prevalence of asthma in obese and overweight individuals throughout the world. Although such studies do not address the direction of causality, several large epidemiologic studies have found that obese individuals have an increased odds ratio or relative risk of developing asthma (defined as a body mass index [BMI] $\geq$ 30).[2,3]

Weiss suggested that obesity and asthma share common etiologies, for example, common effects of fetal programming or common genetics.[4]

Obesity could cause either respiratory symptoms or more fundamental changes in the airways leading to asthma by several mechanisms. In obese people, symptoms of breathlessness and wheeze may be due to increased work of breathing. Alternatively, obesity may have a direct effect on the mechanical behavior of the respiratory system by altering lung volume, airway caliber, or respiratory muscle strength. In obese subjects functional residual capacity (FRC) is reduced by approximately 500 ml,[5]

The biologic basis for the relationship between obesity and asthma has not been established, but several mechanisms have been proposed, including common genetic etiologies, co-morbidities, effect of obesity on lung mechanics, and the role of inflammatory mediators secreted by adipose tissue (adipokines).[6]

Obesity may increase the risk of asthma through its

effects on other disease processes such as sleep-disordered breathing (SDB) and GERD. The effect of these disease processes on the development of asthma is controversial. In a community-based cohort study of almost 800 asthmatics, Sulit and coworkers [(3)] reported that the association between obesity and asthma was strong even after adjusting for SDB. GERD is associated with increased AHR and wheezing as a result of vagal nerve stimulation by acid refluxing into the distal esophagus and micro-aspiration of acid into the bronchi. Treatment of GERD with medications or surgical intervention with Nissen fundoplication improves asthma control and decreases bronchial hyperresponsiveness.[7]

Recently, there has been interest in the role of adipokines in the development and perpetuation of asthma.[7]

Obesity is associated with increased leptin levels, which may be associated with increased inflammation in the airways of obese asthmatics [(6)]. It is possible that the effects of obesity on prevalent asthma are exerted either through co-morbid illnesses that are associated with asthma or through mechanical effects of obesity on pulmonary physiology. In obesity, enhancement of normal adipose tissue immune function leads to a systemic inflammatory state, a phenomenon that is implicated in mediating the metabolic and cardiovascular complications of obesity. Interestingly, many of the cytokines found to be elevated in obesity-related systemic inflammation (e.g., tumor necrosis factor a (TNFa) and interleukin 6 (IL6)) are also associated with the development of glucocorticoid insensitivity in asthma.[8]

The aim of the study

1. To determine the effect of (BMI) on asthmatic attack severity.
2. Determine the effect of (BMI) on post bronchodilator response among asthmatics.

PATIENTS AND METHODS

A cross-sectional study conducted, at Baghdad teaching hospital, respiratory clinic and emergency department, over a period of 12 months from March 2011 to March 2012. Total of (109) patients previously diagnosed as asthmatic were included; all were during an acute asthmatic attack, and of different body weight.

Inclusion criteria

1. Previously diagnosed asthmatic patients i.e. previously attend respiratory clinic and underwent Spiro metric test.
2. Adult patients (≥ 18 years old).
3. Those who were urgently attending respiratory clinic or ED for an asthmatic attack

Exclusion criteria

1. Doubtful diagnosis.
2. Patients who have chronic medical illnesses.
3. Smokers.
4. Pregnant asthmatic women.

All patients were initially underwent baseline PEFR test using a simple manual (Wright) flow meter and all readings were recorded. Patients were received treatment at the emergency department in form of nebulized bronchodilator (short acting B2 agonist; salbutamol 0.5 ml in 2 ml normal saline). Then another PEFR test done, weight, height and body mass index (BMI) measured and classified into obese (BMI 30 kg/m^2 or more) and non-obese (BMI less than $30kg/m^2$.[9] The asthmatic attack severity were classified[10]

1. Mild: PEF (76%-100% predicted).
2. Moderate: PEF (51%-75% predicted).
3. Severe: PEF (50% predicted or less).

Post-bronchodilator response: An increase in the PEFR by (200ml) or more from the initial reading indicates a significant response and all readings classified as response and no response.

Statistical analysis: variables presented as numbers and percentages, the age (year) presented as mean ± standard deviation (SD).

Chi square test used for testing the association between obesity and severity of an asthmatic attack, and the association between the obesity and post bronchodilator response to salbutamol nebulizer. Findings with P value less than 0.05 considered significant.

RESULTS

A total sample of 109 asthmatic patients of them 27 were males (24.8%) and 82 were females (75.2%).Their socio-demographic characteristics were summarized in table (1) and according to the WHO classification of BMI (56) patient (51.4%) were obese in different grades of obesity and(53) patients(48.6%) were non-obese.

The asthmatic attack severity showed the following distribution (table 2).

- Around one half (55) patient (50.5%) presented with mild attack.
- Around one third (33) patients (30.3%) presented with moderate attack.
- Around one fifth (21) patients (19.3%) of attacks were severe.

Table 3 summarizes the correlations among asthma severity and other parameters of the study (age and gender).

Concerning the association between Obesity and asthmatic attack severity (table 4,) and post-bronchodilator response, this study found that the relationship between asthma severity and obesity was not statistically significant (P=/>0.05), while weak inverse statistically significant relationship had been found between obesity and the post-bronchodilator response, (p=0.043), table (4, 5). In another ward among (56) obese patient (51.4%), only (25) patient (22.9%) showed

significant response to salbutamol nebulizer while 31 patient had poor response. Among (53) non-obese patient (48.6%), only (33) patients (31.2%) showed significant response to bronchodilator while (19) patients (17.4%). did not.

Table 1: Demographic characteristics of patients (N=109).

Characteristics		Value	%
Age (year)	Mean ± SD	37.1 ± 9.1	-
	Minimum-Maximum	18 – 50	-
Age Group (year)	< 20	4	3.7%
	20-29	21	19.3%
	30-39	36	33%
	40-49	37	33.9%
	50-59	11	10.1%
Gender	Male	27	24.8%
	Female	82	75.2%
Body Habit	Obese (BMI ≥30kg/m^2)	56	51.4%
	Non-obese (BMI <30kg/m^2)	53	48.8%

Table 2: Distribution of patients by asthmatic attack severity.

Asthmatic Attack Severity	No. of patients	%
• Mild	55	50.5
• Moderate	33	30.3
• Severe	21	19.3

Table 3: The distribution of study group according to asthmatic attack severity and some demographic characteristics (age, gender).

Variables		Asthmatic Attack Severity		
		Mild N=55	Moderate N=33	Severe N=21
Age Group (year)				
< 20	No.	4	0	0
	%	7.3	0.0	0.0
20-29	No.	10	6	5
	%	18.2	18.2	23.8
30-39	No.	22	9	5
	%	40.0	27.3	23.8
40-49	No.	15	15	7
	%	27.3	45.5	33.3
50-59	No.	4	3	4
	%	7.3	9.1	19.0
Gender				
Male	No.	12	7	8
	%	21.8	21.2	38.1
Female	No.	43	26	13
	%	78.2	78.8	61.9

Table 4: The relationship of obesity with asthma severity and response to treatment.

		Obese		Non obese		P Value
		N	%	N	%	
Asthma severity	Mild	25	22.9%	30	27.5%	
	Moderate	22	20.2%	11	10.1%	0.107
	Sever	9	8.3%	12	11.0%	
Post-bronchodilator response	Significant response	25	22.9%	33	30.2%	0.043
	No significant response	31	28.4%	20	18.3%	

Table 5: The relationship between obesity and asthma severity among patients with poor response to treatment (N=51)

	Asthma severity			Total	P value
	Mild	Moderate	Sever		
Obese: N (%)	16 (51.6%)	12 (38.7%)	3 (9.7%)	31 (100%)	0.56
Non-obese: N (%)	12 (60%)	5 (25%)	3 (15%)	20 (100%)	
Total	28 (54.9%)	17(33.3%)	6 (11.8%)	51 (100%)	

DISCUSSION

By comparison, of asthmatic attack severity between obese and non-obese, no significant statistical difference had been found, and the severity of asthmatic attack could not be attributed to obesity. Previous studies were concluded similar results; Thomson CC et al. (2003)[11] also had studied the effect of BMI on asthma severity among five hundred seventy-two (572) patients aged 18 to 54 years presenting with acute asthma and they declared that despite lingering concerns about the veracity of "asthma" among obese individuals, asthmatic attack severity among obese and non-obese adults were remarkably similar. Similarly Mansell et al[12] study and Lavoie et al[13] study were studied the effect of BMI on asthma severity and control and found that BMI had no significant effect on severity of asthma but worse effect on control of asthma although they were studied small samples of patients. In Iraq, Al kadhimia teaching hospital, Similar study had been conducted consistent with our study by Jawhar G.A.[14] although it`s sample size was quite small and didn`t exclude smoker from the study.

In contrast to these findings, Akreman et al (2004)[15], Cassol et al[16] and Varraso et al (2005)[17] studies were suggested a direct association between BMI and asthma severity. This discrepancy with these studies might be attributed to the differences in the determinants of severity; also, they depended on other parameters rather than that of our study like frequency of exacerbations.

Regarding the effect of obesity on the post-bronchodilator response, our study had found a weak inverse relationship (P=0.043), i.e. obese asthmatic patients were relatively less responding to treatment than non-obese, this finding agreed with the study of obesity and asthma Stephanie A shore [7] he concluded that obesity impacts asthma control and response to standard asthma therapeutics. He recommended that treatment of obese asthmatic patients should include a weight control programs.

CONCLUSIONS

1) The prevalence of obesity was high among asthmatic patients.
2) Despite the general concern about the magnitude of obesity on asthmatic attack severity, our study didn`t find significant effect of obesity on asthmatic attack severity.
3) Our study found that most obese patients showed poor post bronchodilator response**.**

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