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ORIGINAL ARTICLE

Serum levels of adiponectin and leptin in asthmatic patients and its relation with asthma severity, lung function and BMI

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KEYWORDS
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Abstract
Introduction: Asthma is one of the diseases which has a high prevalence in developed and developing countries. The relationship between asthma and obesity has always been focused by researchers. In this field, adipokines, especially adiponectin and leptin have highly attended by the scientist. The aim of this study was to determine the serum level of adiponectin, leptin and the leptin/adiponectin ratio in asthmatic patients and its relationship with disease severity, lung function and BMI (body mass index).
Methods: In this cross-sectional study, 90 asthmatic women admitted to the tertiary referral hospital in Kurdistan province – Iran, were examined. First, BMI was measured and then pulmonary function tests were performed in all asthmatics patient. Forced expiratory volume in 1 s (FEV1), forced vital capacity (FVC), and FEV1/FVC, were measured. At the end, blood samples were collected and serum level of adiponectin and leptin were measured by ELISA method.
Result: Serum leptin and leptin/adiponectin levels correlated positively with asthma severity and BMI ($p = 0.0001$), but there was no correlation between adiponectin level with asthma severity and BMI ($p > 0.05$), also serum leptin and leptin/adiponectin levels inversely correlated with FEV1 and FVC in patient ($p = 0.0001$).
Conclusion: Asthma is linked with obesity, and there is an association between asthma severity and BMI with serum leptin and leptin/adiponectin levels, but our results do not support a significant role of adiponectin in obesity or asthma.

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Introduction

Several studies have reported the spread of asthma and obesity as a health problem in the world.[1–4] The prevalence of obesity in America (BMI $\geq$30 kg/m^2) in 20–74 year adults has increased from 15% in 1970 to 35% in 2010. The World Health Organization has estimated the number of obese or overweight people in the world as 2 billion people.[5]

Asthma is also one of the diseases which has a high prevalence in developed and developing countries so that asthma and allergy has affected 1/3 of the children in some Western countries.[6,7] Asthma has affected 22 million people in America and 300 million people in the entire world.[8] In Iran, according to the statistics provided by allergy and asthma clinic, 10% of people are suffering asthma.[9]

The relationship between asthma and obesity has always been focused by researchers, and different studies have indicated various results in this area.[10–12] Epidemiological studies indicate that the lifestyle is one of the most important factors affecting asthma. These studies consider the role of inactivity and consumption of high-calorie foods in the prevalence of asthma. High-calorie diet with inactivity leads to obesity in adolescents and adults.[13] Longitudinal surveys have shown that obesity is the beginning of asthma and the relative risk of asthma is aggravated by obesity.[14] The mechanisms of developing this relationship could include mechanical effects such as constriction of respiratory tract due to smooth muscles of the of the airways, the effects of adipose tissue on the immune system function, hormonal factors, nutritional factors and inactivity.[15] As possible mechanisms through which obesity could lead to the development of asthma in adults, decreased lung function by changing the balance of inflammatory and pre-inflammatory cytokines along with a diet, obesity, atopy and hormonal effects have been discussed.[16] Disruption of immune tolerance due to cytokines and adipokines associated with obesity, is another mechanism that links obesity to asthma and autoimmune diseases.

Despite much research, the relationship between asthma and obesity remains unclear and has not been definitively identified and confirmed.[10,11] Adipokines, especially adiponectin and leptin have highly attended by the scholars in this field. Leptin plays an important role in the regulation of appetite, body weight and energy balance. Leptin and its receptors which are expressed on the surface of the airways can be associated with asthma. Leptin is a pro-inflammatory factor that affects the innate and adaptive immune system, and increases in obese individuals as well.[17]

Unlike leptin, adiponectin reduces in obese people and is considered as an anti-inflammatory factor that inhibits proinflammatory cytokines (TNF-a, IL-6, and nuclear factor kB) and the stimulation of anti-inflammatory cytokines (IL-10 and IL-1 receptor antagonist).[17] According to the above information, the hypothesis of the relationship between adipkine and asthma was established. Animal studies strengthened this hypothesis.[18] It became clear that adiponectin reduces allergen-induced airway inflammation and hyperresponsiveness in mice.[19] Some human studies have relatively supported the hypothesis. In a case–control study in premenopausal women, it was guessed that leptin may be a dependent risk factor for asthma.[20] In another study, it was found that a high serum adiponectin concentration may protect against current asthma in premenopausal women but does not explain the association between asthma and adiposity.[21] However, some human studies have not support the hypothesis and did not report any relationship between adipokines and asthma.[22,23]

Therefore, this hypothesis has not been definitely confirmed in human studies and there is a need for more studies.[24] The aim of this study was to determine the serum level of adiponectin and leptin, and leptin/adiponectin ratio in asthmatic patients and its relationship with disease severity, lung function and BMI.

Methodology

Study population

In this cross-sectional study the study population is comprised of asthmatic women admitted to tertiary referral hospital in Kurdistan province-Iran.

Inclusion criteria

The individuals were examined by asthma and allergy specialists and their illnesses were confirmed according to GINA and spirometric criteria. Then, they were entered the study.

Exclusion criteria

Having other allergic diseases at the same time, the use of corticosteroids for two weeks before blood collection, the use of asthma medications such as bronchial dilators 24 h before sampling, other acute and chronic diseases including upper and lower respiratory system infections and finally the presence of any infectious disease for at least the past two months.

Sample size and sampling method

Samples were selected using a convenience sample method. Considering the 5% type I error, study power of 95%, the sample size was calculated as 60 where 90 samples were studied in order to increase accuracy. Therefore, 90 patients were randomly selected from among the patients with asthma who were admitting the tertiary referral hospital of Kurdistan-Iran. Patients were enrolled deliberately and after filing consents.

Practical and hormonal tests

The height of all the subjects was measured by a standard wall-mounted stadiometer and their weight was also measured by calibrated electronic scales. BMI was calculated by the ratio of weight to height.

Pulmonary function tests in all patients were performed by using a spirometer (spirolab III-Italy). ATS guideline was used to interpret the information from.

Blood samples of the individuals were collected by skilled and qualified technicians. After 10 min after being centrifuged at 3000 rpm, the serum was separated and stored at $-70\,^{\circ}$C. The samples were thawed before being