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Serum IgE Level among Healthy Obese Subjects Acute Response to one Bout Exercise Test

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ABSTRACT: This study aimed to determine relation in serum IgE with anthropometrical markers in inactive obese subjects, to assess IgE response to one bout exercise test in mentioned subjects. For this purpose, fifteen inactive adult obese men (BMI, 30-36 kg/m^2; age 35-45 years) participated in study. Anthropometrical markers and fasting serum IgE were measured, serum IgE was also measured immediately after moderated running test. Pre and post exercise values on IgE was compared by T test Method. P value of <0.05 was accepted as significant. Serum IgE was positively correlated with body weight, abdominal obesity and BMI as obesity determinants ($p < 0.05$). Exercise test resulted in significant increase in serum IgE in studied subjects ($p < 0.001$). These data suggest that 1) obesity can be related with allergic property 2) one bout exercise test can be associated with allergic property in inactive obese subjects.

Keywords: Allergy, Obesity, Single bout exercise, Weight

INTRODUCTION

Obesity, or overweight, is one of the worldwide health problems whose incidence is increasing in developing and developed countries. Increasing trend of obesity, particularly abdominal obesity, is associated with the increased risk of many chronic diseases, such as lung diseases, diabetes, hypertension, and other metabolic conditions [1]. The literature supports a relationship between the elevated levels of body fat, or obesity, and respiratory diseases such as asthma [2]. Their findings suggest that after normalizing the other factors in respiratory diseases, such as asthma, their prevalence in obese or overweight subjects was significantly higher than those with normal weight [3].

Based on this evidence, the researchers believe that weight gain and weight loss are respectively associated with reduced and increased severity of respiratory and allergic diseases [4]. Clinical observations also support the higher levels of allergic symptoms in obese subjects [5]. Among immunoglobulins, Immunoglobulin E (IgE) is a good predictor of allergic and respiratory diseases such as asthma [6] as an increased plasma concentration is associated with increased disease severity [7]. IgE is one of the five immunoglobulins of the body. Similar to other immunoglobulins, IgE is produced by B cells and plasma cells. IgE levels in the blood circulation are very low unlike other immunoglobulins because the mast cells have very high potential for absorbing IgE. IgE synthesis rate is also low. Its half-life in mast cells is more than 10 days. IgE levels often elevate in allergic conditions, and their increased levels aggravate the allergic, inflammatory, and infectious diseases as well as asthma [8].

Researchers have noted that obesity is associated with allergic symptoms or increased IgE levels [9, 10]. Hence, it appears that weight loss or reduced low body fat levels are associated with reduced IgE levels or reduced severity of obesity-related chronic respiratory diseases through internal or external intervention. Among the external intervention, the role of exercise have been identified as a factor in the improvement of inflammatory factors in patients with obesity or other obesity-related chronic diseases [11, 12]. However, some studies have reported the ineffectiveness of long-term training program on inflammatory factors in obese or patient populations [13, 14]. The effect of short-term training sessions on the allergic markers such as serum IgE in obese individuals has not been studied. Therefore, the present study aimed at determining the effect of on session of moderate-intensity running on IgE levels in a group of obese men.

METHOD AND SUBJECTS

Fifteen apparently healthy obese men aged 35-45 years and BMI 30-36 kg/m2 were assigned for this study through local advertising. Participants were untrained and no smokers. All participants signed an informed consent document approved by the Ethics Committee of Islamic Azad University, Iran.

A medical history to retrieve information about health status, current medications and a physical examination including height, weight, body mass index. Subjects had not participated in regular exercise for the preceding 6 months and have stable body weight. The exclusion criteria were infections, renal diseases, hepatic disorders and a history of other chronic diseases.

A. Anthropometric measures

Each subject was measured for body weigh and other anthropometrical markers. Height and weight of participants were measured by standard procedures (in underwear, but barefoot). Waist circumference was measured at the midpoint between the lower edge of the rib cage and the top of the iliac crest. Waist to hip circumference ratio was measured by dividing the abdominal circumference into that of the hip. Body mass index (BMI) was calculated by dividing body mass (kg) by height in meters squared (m^2). Percentage body fat was measured using body composition monitor (OMRON, Finland).

B. Blood biochemistry examination and Exercise

Blood was collected after overnight fast at 8.00 a.m. blood used for serum IgG. The Intra- assay coefficient of variation and sensitivity of the method were 5.87% and 1.0 IU/mL, respectively for IgE (Monobind Inc, CA 92630, USA). Serum IgE were measured immediately after exercise test. All subjects were completed 40 min running on surface with no slope. On the other hand, subjects was runnel 40 min with a moderate intensity at 70 (%) of maximal heart rate. Target heart rate was monitored by polar telemetry.

C. Data analysis

All data were tested for normal distribution by the Kolmogorov-Smirnov test. Statistical tests were performed using SPSS Software (SPSS 15.0, free evaluation version). Pre- and post exercise serum IgE was compared between conditions using a paired-samples t-test. $P>0.05$ was considered as non-significant.

RESULTS

Characteristics for the subjects are described in Table 1. Data were expressed as mean ± SD. Mani objective of present study was to evaluate serum IgE response to mentioned running test in obese subjects. Compared to pre-exercise, serum IgE concentration increased significantly after cycling test (from 85 ± 42 to 95 ± 41 IU/ml, $p < 0.001$).

We also determined the association of serum IgE with some anthropometrical markers as obesity determinants in studied subjects. Serum IgE was strongly and positively associated with body weight ($p = 0.000$, $r = 0.85$, Fig. 2). A significant positive correlation was observed in IgE with abdominal circumference ($p = 0.02$, $r = 0.61$, Fig. 3). Serum IgE was also correlated with body mass index in studied subjects ($p = 0.03$, $r = 0.57$, Fig. 4).

Table 1: Descriptive statistics of anthropometrical markers and serum IgE of studied subjects.

	Minimum	Maximum	Mean	Std. Deviation
Age (year)	34	41	38.20	2.11
Height (cm)	160	176	171.7	5.19
Weight (kg)	80	105	94.3	8.26
Abdominal (cm)	89	112	100	7.73
Hip (cm)	86	111	99	8.38
AHO	.97	1.03	1.01	0.02
BMI (kg/m2)	29.41	34.29	31.93	1.55
Body Fat (%)	30.3	36.8	32.5	2.01
IgE (IU/ml)	14	153	84.9	42.17

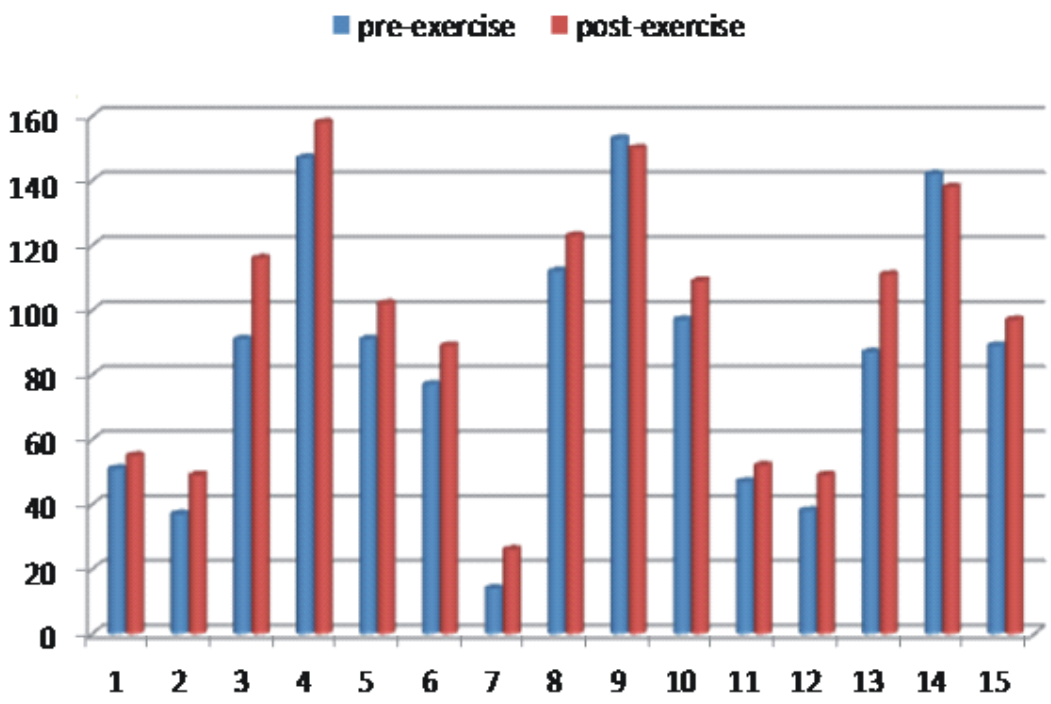

Fig. 1. A significant increase in IgE by exercise test in studied subjects.

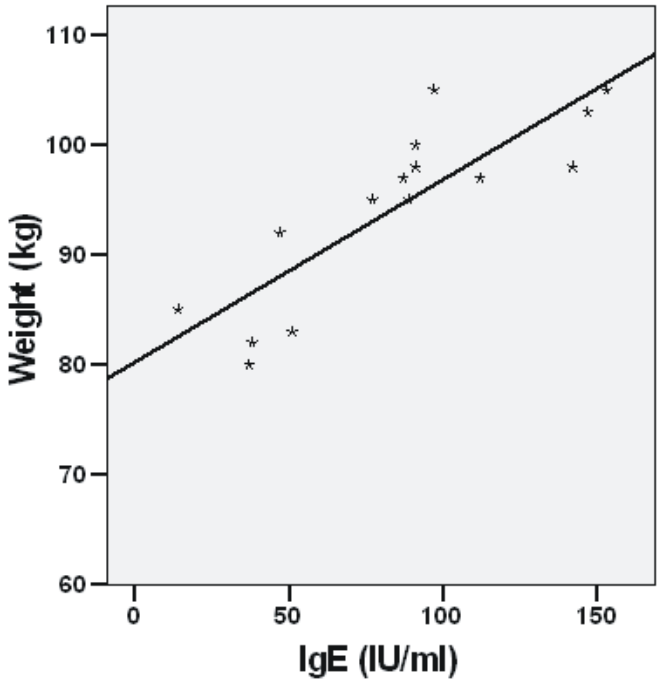

Fig. 2. Positive correlation between IgE and Body weight.

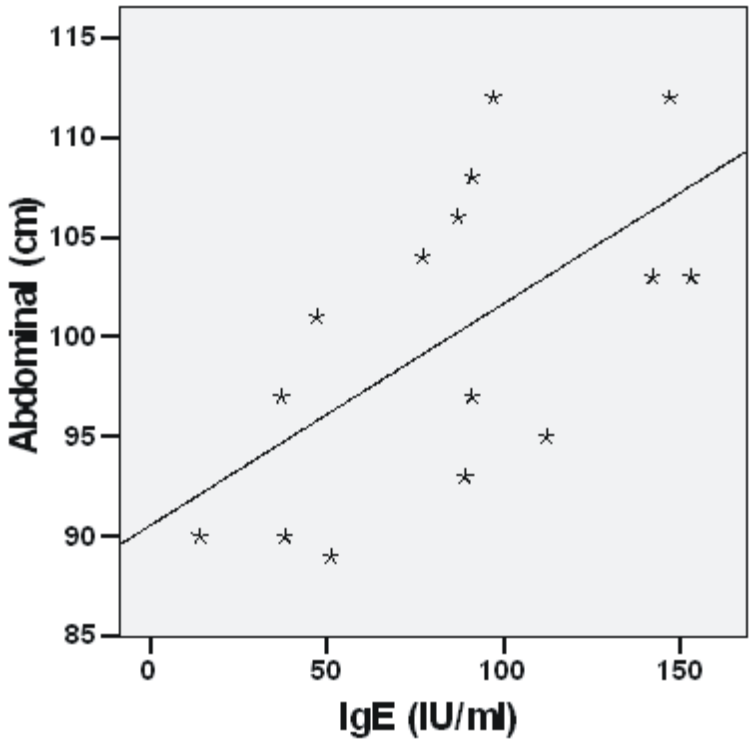

Fig. 3. Positive correlation between IgE and abdominal obesity.

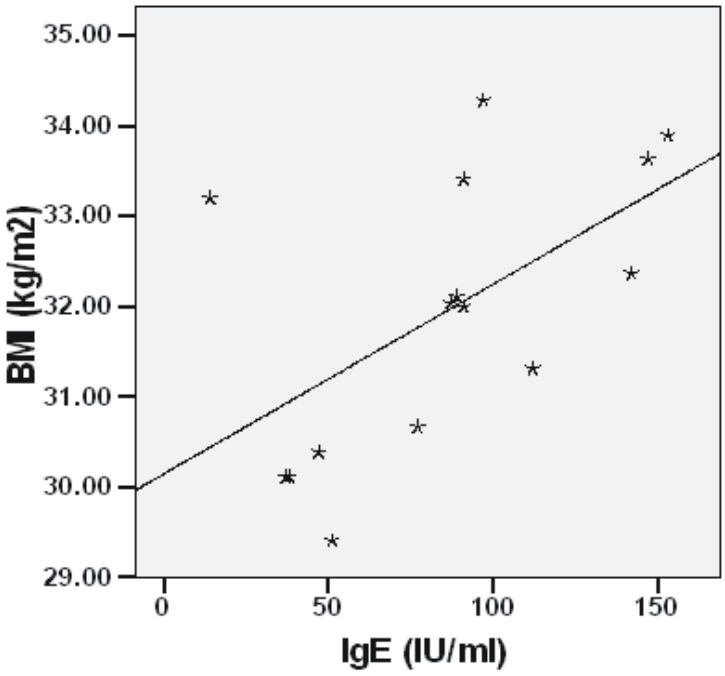

Fig. 4. Positive correlation between IgE and body mass index.

DISCUSSION

In the present study, the response of serum IgE to a relatively long running session was significant. A 40-minute moderate-intensity running session significantly increased the serum IgE levels in obese men. These findings somehow support the inflammatory effects of this training protocol in the obese men who already had a sedentary lifestyle. Today, obesity is a widespread epidemic. According to WHO, more than a billion people suffer from obesity or overweight worldwide, and 300 million of them are classified as obese [15]. These studies suggest that the IgE levels in obese patients are significantly higher than those with normal weight [16]. Some studies have proposed the fat mass index as a predictor of IgE levels in obese subjects [17]. Thomas (2003) indicated the important role of IgE in the obesity-related asthma [18].

IgE is a key factor in the pathophysiology of asthma and inflammatory reactions in the respiratory pathways. Its antibodies inhibit the incidence and the increased respiratory pathways inflammation [19]. Some studies have reported its increased plasma levels in obese or overweight individuals compared to the normal weight subjects. In this regard, Vincennes (2009) suggested that IgE levels in obese or overweight children and adults are much higher than those with normal weight which is associated with allergy and respiratory diseases [16]. Wilder (2008) studied 4000 children and reported higher levels of IgE in overweight or obese children compared to those with normal weight [20].

Consistent with those findings, the present study showed a significant relationship between serum IgE levels with some obesity indices in obese men. The relationship between the serum IgE levels and body weight, waist circumference, and hip circumference were significant and positive. On the other hand, the relationship between the serum IgE levels with other indices such as body mass index was direct but non-significant which may be due to the low number of samples. It is also possible that body fat percentage and other obesity factors indirectly affect the serum IgE levels in obese individuals though affecting other inflammatory or hormonal factors. In this regard, the findings of a previous study suggest a significant relationship between IgE levels and interleukine-1 beta (IL-1B) in obese subjects [21]. However Leung (2009) did not report significant differences in IgE levels between obese and normal weight subjects [22].

Significantly increase in IgE levels in response to an exercise session particularly immediately after the cessation of tests is not unexpected. Although there are few studies on the acute response of IgE to an exercise session in obese healthy or patients subjects, some of these studies have shown that only those exercise tests that have negative energy balance or a duration of 60 minutes or more are associated with anti-inflammatory properties [23, 24]. On the other hand, a significant increase in IgE following a session of exercise test in obese subjects has also been reported by some recent studies [25]. It is also possible that the anti-inflammatory or anti-allergic effects of single-session exercise tests appear in delay periods after the exercise test.

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