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IMONOGLOBIN-E IN TYPE II DIABETES AND ITS RESPONSE TO SINGLE BOUT EXERCISE TEST

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ABSTRACT
In present study, we aimed to compare serum IgE between obese men with and without diabetes. We also aimed to evaluate acute response of IgE to single bout exercise in diabetes subjects. For this purpose, fasting serum IgE was measured in untrained adult obese men with (n=14) and without (n=14) type II diabetes. Serum IgE was also measured immediately after short time single bout cycling in patients group. Independent T test used to compare serum IgE between two groups and paired sample T test for determine changes between pre and post exercise in patients. Serum IgE levels were significantly higher in patients in comparison to healthy subjects ($p = 0.022$). Fasting glucose concentrations and insulin resistance were also higher in diabetic than in healthy subjects ($P < 0.05$). Compared to pre-exercise, serum IgE did non change by exercise test in patients ($p = 0.783$). These results demonstrate that acute bout cycling with a moderate-intensity is associated with increase serum level of IgE in diabetic individuals.

KEYWORDS: Allergic, Diabetes, Obesity, Short time exercise.

INTRODUCTION
Although insulin resistance and hypoglycemia are among the main symptoms of diabetes, researchers believe that diabetes, especially type 2 diabetes, is not only associated with the dysfunction of insulin and the homeostasis of glucose but also it has a relationship with other chronic diseases as certain evidences indicate. Type 2 diabetes is associated with multiple factors such as obesity and cardiovascular diseases (Wang et al., 2011). Besides the genetic phenomenon, obesity is among the main factors in the prevalence of diabetes especially after adolescence (Kaplan, 2002). Also, scientific evidence supports the fact that the prevalence of obesity is a predisposition for some other diseases such as respiratory diseases including asthma (Nystad et al., 2004). The role of obesity in allergic diseases has been reported by some researchers (Visness et al., 2009). The researchers have found increased levels of allergic markers such as Imonoglobin E (IgE) in obese individuals (Visness et al., 2009). Mast cells are among the tissues responsible for the allergic response (Theoharides et al., 2006; Bradding et al., 2006). Similarly, some studies have suggested that these cells also play an important role in diseases associated with obesity and type 2 diabetes (Wang et al., 2011). It should be noted that Mast cells have many connecting points and high absorption power of IgE (Winter et al., 2000). Scientific resources suggest increased IgE levels of serum in obese people (Visness et al., 2009; Wilders-Truschnig et al., 2008). Also, higher levels of IgE, in combination with certain inflammatory cytokine such as CRP, have been introduced as pre-diabetes risk factors or type 2 diabetes (Wang et al., 2011). However, there is no study to have directly compared IgE levels in type 2 diabetics to those in healthy individuals. Therefore, the present study was carried out to compare IgE levels in diabetics and non-diabetics. Although there is much research investigating the effect of training programs on inflammatory and anti-inflammatory cytokine in type 2 diabetics and other diseases linked to obesity, have there has been reported somewhat conflicting findings in the literature (Eizadi et al., 2011; Legakis et al., 2004; Bouassida et al., 2004). But there has no study so far as to investigate the effects of single exercise training on serum IgE levels in the patients. In this respect, another purpose of the present study is to identify the acute response of IgE serum to a short-term exercise in type 2 diabetic patients.

MATERIALS AND METHODS
Subjects and group inclusion
Subjects were untrained adult men with type II diabetes (n=14) and men healthy (non-diabetes, n=14) matched ore age 35-46 years and body mass index (BMI) 30-36 kg/m2. Subjects of two groups were in obesity category. All subjects were non-smokers and had not participated in regular exercise/diet programs for the preceding 6 months. Subjects were asked to complete questionnaires on anthropometric characteristics, general health, smoking, alcohol consumption, and present medications. All subject of non-diabetes group were healthy and without medications. Those with a history of other chronic diseases were excluded of diabetes group. Those that were unable to avoid taking drugs for 12 hours

before blood sampling were also barred from participating in the study. All study participants completed the consent process and provided written informed consent prior to randomization.

Anthropometry

Anthropometric measurements of height, weight, percent body fat, and circumference measurements were taken by the same trained general physician for two times and the average was reported. Body weight was measured in duplicate in the morning following a 12-h fast. Height was measured with high precision with an error of ± 0.1 cm. BMI was calculated as weight (kg) divided by squared height (m). Abdominal and hip circumference were determined in a standing position at the end of normal expiration and ratio between them (AHO) was calculated for each subjects.

Blood biochemistry examination and exercise protocol

A venous blood sample was collected from all the subjects who came after a 12-h overnight fast. The subjects did not perform any exercise for 48 hours before the blood collection. Blood samples were analyzed for glucose, insulin, and serum IgE. Plasma glucose was measured with the glucose oxidase method. Insulin was determined by ELISA method (Demeditec, Germany) and the intra- assay and inter-assay coefficient of variation of the method were 2.6% and 2.88 respectively. The Intra- assay coefficient of variation and sensitivity of the method were 5.87% and 1.0 IU/mL, respectively for IgE. Serum IgE was also measured immediately after exercise test according to YMCA protocol in patients. The original YMCA protocol uses three or four consecutive 3-minute workloads. However, we modified the YMCA protocol to extend to 4-minute stages in order to more accurately detect steady state HR. Subjects performed cycler ergometry at a cadence of 50 rev/min, and the initial work load was 25 Watts. The heart rate during the last 15 seconds was used to determine subsequent workloads (if HR <80 beats/min:125 Watt; 80 to 90 beats/min:100 Watt; 90 to 100 beats/min:75 Watt; and >100 beats/min: 50 Watt). The test was terminated when two workloads were completed with heart rates between 110 and 150 beats/min. The subjects rested approximately 15 minutes before completing the second submaximal test.

Data Analysis

Data were expressed as mean ± SD individual variables were compared using computer with SPSS version 16 program. Normal distribution of data was analyzed by the Kolmogorov-Smirnov normality test. Comparisons between the means of each group were done using the independent t-test. Student's paired 't' test was applied to compare the pre and post exercise values. All statistical tests were performed and considered significant at a $P \leq 0.05$.

RESULTS

Serum IgE levels were compared between adult obese men with and without type II diabetes. Table 1 show the descriptive anthropometric and biochemical features of the study groups.

Table 1: Anthropometric and metabolic characteristics of the study participants

Variables	Diabetes	Non-diabetes
Age (year)	*41.9 (5)*	*10.9 (2.8)*
Height (cm)	*173.3 (4.9)*	*173.8 (2.7)*
Weight (kg)	*93.2 (8.3)*	*96.2 (7.1)*
Abdominal circumference (cm)	*103.9 (7.4)*	*104 (4.3)*
Hip circumference (cm)	*102.4 (4.3)*	*104 (5.4)*
Body mass index (kg/m^2)	*31.04 (2.52)*	*31.80 (1.91)*
Body Fat (%)	*29.1 (3.97)*	*31.2 (1.91)*
Glucose (mg/dl)	*217 (65)*	*101 (10)*
Insulin (IU/ml)	*5.57 (1.73)*	*8.87 (2.28)*
Insulin resistance (HOMA-IR)	*4.51 (1.21)*	*2.19 (0.55)*
Insulin sensitivity (HOMA-IS)	*0.50 (0.03)*	*0.60 (0.04)*
Serum IgE (IU/ml)	*133 (50)*	*84 (54)*

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There were no statistically significant differences between the non-diabetic and diabetic groups with regard to all anthropometrical markers ($P > 0.05$). Serum IgE levels in diabetes patients showed were significantly higher than healthy subjects ($p = 0.022$). We also compared fasting glucose, insulin and insulin resistance between two groups. Based on statistical analysis, fasting glucose concentrations and insulin resistance were higher in diabetes men than in non-diabetic group ($p < 0.05$). As mentioned previous, acute response of IgE to cycling test in diabetes patients was main objective of present study. To response this aim, no significant change was observed in serum IgE after exercise test when compared with pre-test (from 133 ± 50 to 128 ± 64 IU/ml, $p = 0.783$, Fig 1).

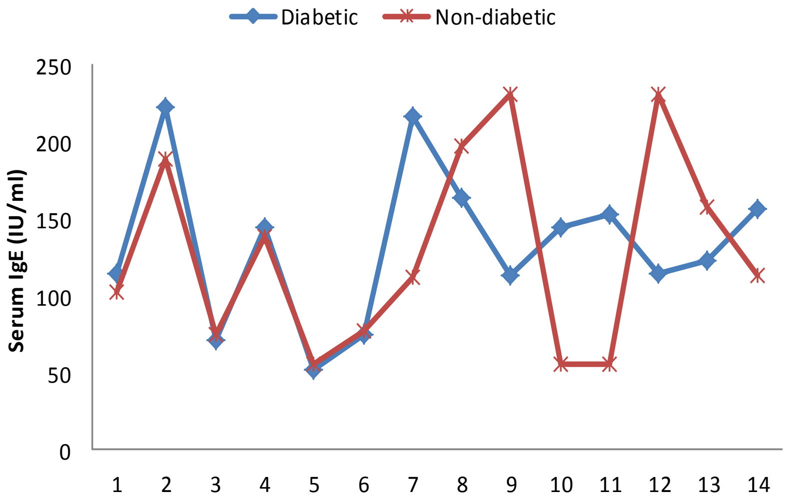

Fig 1: Serum IgE before and after cycling test: No significant change by exercise test.

DISCUSSION

The first finding of the present study was that IgE serum levels were higher in diabetics compared to non-diabetics. In other words, obese men with type 2 diabetes have higher IgE levels compared to non-diabetic obese men. In line with other previous findings that have stressed the importance of IgE in obesity and diabetes, these findings indicate that apart from the obesity factor, diabetes also affects the levels of IgE serum. Although it cannot be directly concluded whether type 2 diabetes leads to increased IgE or higher IgE levels affect diabetes intensity. Scientific resources report higher levels of IgE in respiratory diseases such as asthma that is somehow associated with obesity (Burrows et al., 1989). Furthermore, levels of IgE have been reported in the presence of obesity which is the base of type 2 diabetes (Visness et al., 2009; Wilders-Truschnig et al., 2008). Lipase plasma levels secreted from mast cells increase significantly in patients suffering from myocardial infarction or angina (Xiang et al., 2011). It has recently been identified that IgE plasma levels are associated with coronary artery thickness (Wang et al., 2011). The plasma IgE levels in patients suffering myocardial infarction are twice as much as that in those who suffer from no coronary disease (Wang et al., 2011). Some researchers have reported that IgE leads to an increase in the activity of certain metabolic risk factors such as macrophages, endothelial cells and cytokine or chemokines production (Wang et al., 2011; Liu et al., 2009; Weisberg et al., 2003; Xu et al., 2003).

Mention should be made that Mast cells are among the tissues responsible for allergic responses (Bradding et al., 2009; Theoharides et al., 2006). The role Mast cells play in type 2 diabetes and some other diseases associated with obesity has been previously reported (Wang et al., 2011). The mice lacking mast cells remained protected against diabetes compared to those mice that had been exposed to the medicines inhibiting Mast cells (Liu et al., 2009). These resources confirm allergic markers or disorder in allergic receptors in the incidence or severity of type 2 diabetes, because Mast cells are among the important IgE receptors as allergic markers (Theoharides et al., 2006; Bradding et al., 2006). In response to diabetes risk factors, factors secreted from mast cells play a special role in the prevalence of pre-diabetes or type 2 diabetes. In combination with other clinical information, the literature mentions the possible role of IgE in the pathogenesis of type 2 diabetes. Despite higher IgE levels in diabetics than non-diabetics, exercise test did not lead to significant changes in this allergic marker. In other words, a short running session with moderate intensity did not affect IgE levels serum in diabetic patients. Although limited studies have been conducted to determine the IgE acute response to a single session of exercise in healthy or diabetic populations, the finding vary as regards the response of other inflammatory markers to single-session exercise tests depending on the basic levels of the dependent variables, the study population, measuring instruments or type of exercise test. For example, in one study, 20 min intense running led to significant decrease in serum leptin in middle-aged men and women (Legakis et al., 2004). However, in another study, the maximum short-term activity did not result in changes in leptin and insulin plasma concentrations (Bouassida et al., 2004). Some scientific resources have reported that only the activities coupled with prolonged exercise tests more than 60 minutes or negative energy balance can improve the inflammatory profile in the diabetic populations (Hqjbjerref et al., 2007; Kraemer et al., 2000). However, in a similar relatively new study, a short session of biking with moderate intensity led to a significant reduction in IgE in asthmatic patients (Eizadi et al., 2011).

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