Serum interleukin 1 beta in sedentary healthy obese and non-obese men

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Abstract

Obesity is associated with low-grade systemic inflammation and plays a key role in the pathogenic mechanism of chronic diseases. This study was aimed to compare serum IL-1ß between obese and non-obese men. For this purpose, fasting blood samples were obtained of fifteen sedentary obese and fifteen non-obese men matched to age and height (34 – 44 years, 170 – 180 cm) in order to measuring serum IL-1ß and compare between two groups. Data of independent T test showed that serum IL-1ß was significant higher in obese when compared to non-obese group (2.42 ± 0.87 obese vs 1.76 ± 0.64 non-obese, pg/ml, p = 0.026). There was no significant correlation between IL-1ß and body mass index in obese subjects (p = 0.75, r = 0.09). Based on these data, we can say obesity has an inflammation property in even healthy subjects and increased serum IL-1ß may be due to disturbance of other cytokines in this population.

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**Introduction**

Similar to tumor necrosis factor alpha, interleukins are also involved in creating innate and inflammatory immune responses. Scientific evidences have revealed that the levels of IL-1β is not only of special importance in inflammatory and respiratory diseases, but disturbance in its systemic levels affects metabolic disorders effective on obesity and body fat levels (Urboniene et al., 2008; Guler et al., 2004). In addition, the findings indicate a significant relationship between increased levels of IL-1β and change in BMI (Saltevo et al., 2007). But in Cosette’s study (1991), no significant correlation was observed between plasma levels of IL-1β and BMI as a predictor of obesity (Gosset et al., 1991). Scientific studies have frequently pointed out that increased serum or plasma level of this inflammatory cytokine is associated with increased insulin resistance (Urboniene et al., 2008; Guler et al., 2004). It is known that IL-1β levels rise in obesity and lead to a decreased insulin secretion from beta cells of the pancreas (Osborn et al., 2008). Its role in lipid metabolism through regulating insulin levels and lipase activity has also been reported (Matsuki et al., 2003). Scientific resources have revealed that increased secretion of IL-1β results in lung inflammation, destruction of pulmonary alveoli elastic fibers, fibrosis or obstruction of respiratory tract wall, and accumulation of lymphocytes in airways of respiratory patients (Urboniene et al., 2008). Some literature has reported its higher levels in smokers than non-smokers (Frohlich et al., 2003). Despite these findings, no association was observed between serum levels of IL-1β and body mass index in another study (Segura et al., 2007). According to some studies which stated the lack of correlation between IL-1β and indicators of obesity, the present study is carried out aiming to compare this inflammatory cytokine between obese and normal weight men.

**Method and Subjects**

*Study population, inclusion or exclusion criteria*

Subjects included fifteen sedentary healthy obese and same numbers non-obese men matched to age and sex (aged 36.8 ± 2.99 years) participated in this study by accessible samples. After the nature of the study was explained in detail, informed consent was obtained from all participants. The purpose of this study was to compare serum IL-1β between obese and none-obese adult men. A medical history to retrieve information about health status, current medications, alcohol consumption; a physical examination including height, weight, waist circumference were performed of all participants. Participants were non-athletes and non-alcoholics. The exclusion criteria were history of acute or chronic respiratory infections, neuromuscular disease, cardiopulmonary disease and type II diabetes and other chronic diseases.

*Anthropometric measurements*

Anthropometric measurements of height, weight, percent body fat, and circumference measurements of all subjects were taken at first. Weight and height were measured in the morning, in fasting condition, standing, wearing light clothing and no shoes. Body mass index was measured for each individual by division of body weight (kg) by height (m²). Waist-to-hip ratio was calculated as abdominal circumference divided by hip circumference as measured to the nearest 0.5 cm with a standard measuring tape. All of these measurements were conducted by the same researcher.

*Biochemical Analysis*

Participants were instructed not to heavy physical activity for at least 48 h before blood collection. Blood was collected between 8:00 a.m. and 9:00 a.m. after 12-h water-only fast with participants in the seated position. After sampling in ETDA- or serum-tubes, blood was immediately chilled on ice and centrifuged in order to separate serum. Serum was analyzed for measuring IL-1β in two groups. Serum IL-1β was determined by ELISA method Enzyme-linked Immunosorbent Assay for quantitative detection of human IL-1β), using a Biovendor- Laboratorial kit made by Biovendor Company, Austria. The sensitivity of the IL-6 assay was 0.3 Pg/mL.
Statistical analysis

All values are reported as mean and standard deviation. Statistical analysis was done with SPSS 15.0 for Windows. 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. Partial Spearman correlations were calculated to determine the relations of IL-1ß with body mass index and other anthropometrical markers. The results were considered statistically significant for $p<0.05$.

Results

As mentioned, in this study we compared serum resistin in sedentary obese and non-obese subjects. IL-1ß is an inflammatory cytokine and increased in chronic diseases as cardiovascular disease. Anthropometric characteristics of the study participants are described in Table 1. Data of table 1 shows that all anthropometrical markers are significant higher in obese subjects ($p < 0.05$). Based on independent analysis, significant higher serum IL-1ß was found in obese subjects when compared to non-obese group (2.42 ± 0.87 obese vs 1.76 ± 0.64 non-obese, pg/ml, $p = 0.026$, Fig 1). There were no correlations between serum IL-1ß concentrations and body mass index in obese men ($p = 0.75$, $r = 0.09$).

Table 1. Mean and standard deviation of anthropometrical characteristics of studied subjects

<table>
<thead>
<tr>
<th>Variables</th>
<th>Obese group</th>
<th>None-obese group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (year)</td>
<td>36.8 ± 2.99</td>
<td>38.5 ± 3.20</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>101.6 ± 12.25</td>
<td>71.7 ± 6.62</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>176.2 ± 3.65</td>
<td>173.5 ± .96</td>
</tr>
<tr>
<td>Body Fat (%)</td>
<td>32.93 ± 2.55</td>
<td>22.71 ± 1.70</td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td>32.67 ± 3.09</td>
<td>23.77 ± 1.41</td>
</tr>
<tr>
<td>Abdominal circumference (cm)</td>
<td>108 ± 8.9</td>
<td>85.9 ± 4.07</td>
</tr>
</tbody>
</table>

Fig. 1. Serum IL-1ß concentration in obese and normal groups. Data shows higher serum IL-1ß in obese subjects when compared to non-obese group.

Discussion

In addition to genetics and environmental factors such as diet, lifestyle, or levels of daily physical activity, researchers have recently reported the role of metabolic disorders in development of obesity and disorders related to overweight. Peptide hormones secreted by adipose tissue and other endocrine tissues such as gastrointestinal tract have been frequently suggested to be involved in regulation of appetite and energy balance which are considered as the main causes of obesity. Besides a great source of fat, adipose tissue as an endocrine organ secretes some peptide hormones including cytokines or adipokines which have a particular role in energy homeostasis and glucose or fat balance (Kahn et al., 2000; Spiegelman et al., 2001).

Several studies compared the effects of inflammatory cytokine levels in different populations, such as obese and lean, athletic and non-athletic, and healthy individuals and patients. The majority of these studies showed higher levels of inflammatory cytokines in those people who were overweight or had higher body fat percent (Pickup et al., 1997; Grau et al., 1996; Bruun et al., 2003). The present study also supports the increment of IL-1ß levels in obese compared with normal weight men.

Direct and indirect effects of peptide hormones, such as ghrelin, leptin, adiponectin, resistin, visfatin, pre-inflammatory and anti-inflammatory cytokines, and other peptides secreted by adipose tissue and other endocrine tissues, on the prevalence of obesity and its
related disorders have been frequently studied by biochemists and health sciences professionals (Tschop et al., 2001; Yukihiro et al., 2002; Snehalatha et al., 2008). Interleukins 1 beta, including IL-1α and IL-1β, which act as mediators of inflammation in the body have as much as about thirty percent similar structural features, however, they have common receptors and exert relatively similar biological effects. IL-1β plays an important role in inflammation (Matsuki et al., 2003).

It is known that production and secretion of IL-1β is associated not only with inflammatory and immune system diseases but also with metabolic abnormalities (Urboniene et al., 2008; Guler et al., 2004). The main source of this inflammatory cytokine is circulating monocytes, tissue macrophages, and dendritic cells; however, it can also be secreted by B lymphocytes and NK cells (Dinarello et al., 2009). Apart from its physiological functions in protection or preservation of host cells, IL-1β has also an important role in certain severe inflammatory diseases, such as hereditary diseases or polygenic inflammatory diseases which can often be controlled by anti-IL-1β medicines (Kontzias et al., 2012; Quartier et al., 2011). It is shown that similar to IL-1β, the secretion rate of macrophages has a potential association with obesity in mice and humans (Taniguchi et al., 2006; Rui et al., 2002). Its higher levels in obese people have been also reported by some other studies (Taniguchi et al., 2006; Rui et al., 2002). Increased levels of this inflammatory cytokine in respiratory or allergic diseases have been already observed (Urboniene et al., 2008). On the other hand, some studies have introduced obesity as a background for increased respiratory disease (Nystad et al., 2004; Kyle et al., 2009); so that increased and decreased body weight has respectively resulted in decreased and increased severity of asthma as a respiratory disease (Shore et al., 2007). In a general summary, the present study confirms most of the previous findings and stresses on higher levels of IL-1β as an inflammatory cytokine in obese compared to normal weight individuals.

**References**


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