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Research Article

COMPARISON OF SERUM LEVELS OF ZINC AND LEPTIN IN FEMALE ENDURANCE AND SPRINTING RUNNERS WITH NON-ATHLETES

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Abstract

Abstract in consideration of leptin effects such as reducing food intake and increasing energy consumption, many researchers have sought to examine the relation between leptin and exercise. The presence of reports arguing that zinc can be a mediator in leptin production indicates a possible relation between zinc and leptin. The purpose of this study was to compare plasma leptin, plasma zinc, and their relationship in Elite female endurance and sprinting runner(n=15) with non-athletes(n=15).Blood samples were obtained 24 h after training to measure plasma zinc and leptin levels. In the present study, we did not observe any significant difference for plasma zinc and leptin levels between groups($p > 0.05$). There was not significant correlation between plasma leptin and plasma zinc in the study groups.

Keywords: Leptin, Zinc, Athletes.

Introduction

Leptin is a recently described hormone with protein structure(1). It is released from the adipocytes. Leptin was claimed to be an antiobesity factor and has been related to satiety and energy balance acting through the hypothalamus(2,3).Results of several other studies have suggested that leptin may also play a role in the regulation of metabolism, sexual development, reproduction, hematopoiesis, immunity, gastrointestinal functions, sympathetic activation and angiogenesis (4,5).Indeed, there is considerable amount of evidence emphasizing that leptin is an important hormone in the regulation of food intake and body weight in both humans and animals(2).

Zinc has been established as an element involved in growth and development since the 1930s. It is the only metallic element that is found in most enzymatic systems (6). The importance of zinc deficiency in humans was shown in 1961 in malnourished youngsters from Iran and Egypt(7). To date, it has been recognized that zinc plays a role in fat metabolism, appetite control, insulin resistance, and obesity, and it is claimed that zinc deficiency in animals leads to anorexia, weight loss, poor food efficiency, and growth disorders(8,9,10). The fact that obese individuals have low zinc and high leptin levels(10) suggests that there is a relation between zinc and nutrition, and consequently also between zinc and leptin.

Exercise has a pronounced effect on zinc metabolism (11) and leptin levels (12).Hypoleptinemia is a common feature observed in many athletes that is associated with energy deficit provoked by exercise (13) and/or by decreased fat mass (14) .However, a drop in leptin levels is not always proportional to the drop of fat mass(15).

The purpose of this study was to compare plasma leptin and plasma zinc levels and their relationship in female endurance and sprinting runners with non-athletes.

Materials and Methods

Subjects

The study enrolled 30 healthy and voluntary subjects in the 19- 26 age range. The subjects were allocated to two groups:

Group1 (n=15), Control Group: the subjects in this group were volunteers, who did not exercise regularly.
Group 2 (n=15), Experiment Group Including Elite female endurance and sprinting runners: the group included elite endurance and sprinting runners who were selected for the national team in their weight classes, who exercised regularly andwhose measurements were conducted during rest in the training period.

Anthropometric Measurements and Body Composition

Total body mass was measured with a portable scale to the nearest 0.1 kg. Height was measured with stadiometer to the nearest 0.5 cm. Based on the weight and height values, body mass index (BMI) was calculated for each individual using the formula of (weight/height^2). Percent body fat was analyzed with the BI method. An Omron BF 306 Body Fat Monitor was used.

Sample collection

Blood samples were obtained from seated subjects 24 h after intense training in order to avoid the acute change in plasma zinc due to muscle damage and/or to zinc loss by sweat. The athletes were instructed not to eat for 8h before each sample collection. Blood samples (5 mL) were obtained in the morning (8:00 A.M.) by venous puncture into tubes. Blood samples were centrifuged at 3000 rpm for 3 min to separate the serum and blood cells. The separated serum was put into plastic-cap tubes and kept at -20C until analysis.

Biochemical analysis

Plasma zinc measurements: Plasma zinc levels were determined in a Shimatsu ASC-600 model atomic absorption spectrophotometer located in the Biochemistry Department of Ahvaz University of Medical Sciences. Zinc levels were determined as μgdl^{-1}.

Plasma leptin measurements: Leptin analysis in the serum was carried out using a Human Leptin Kit 'RIA test kit' (Linco trademark catalogue no: HL-81K). The results are presented as ngml^{-1}. The limit sensitivity and limit linearity of the determinations are 0.5 and 0.5 ngml^{-1} respectively.

Statistical analysis

Analysis was performed by t-test and Pearson correlation coefficient. Spss16 software was used for statistical analysis And p-value less than 0.05 was considered as statistical significance.

Results

Table1 lists the anthropometric characteristics of the subjects. We did not observe any differences between the studied groups in terms of age, BMI, total height, and weight. However, on analyzing the body composition, the athletes group presented lower values of percent body fat compared to control group ($p < 0.05$).

Table 1 Anthropometric Profile and Body Composition in the study groups

	Athletes N (15)	Non-athletes N (15)
Age(years)	22±2	23±3
Weight(kg)	56±5	54±4
Height(cm)	162±3	162±4
BMI(kg/m^2)	21±2	20±1
% Body fat	27±4*	31±2

BMI: body mass index, *p<0.05

Plasma zinc concentrations were adequate for nutritional status in all subjects [Table 2]. Plasma leptin levels were normal reference range for lean adults(16) [Table 2] and were not significantly different between groups. There was not significant correlation between plasma leptin and plasma zinc in the study groups (Table 3).

Table2 Biochemical Parameters in the study groups

	Athletes N (15)	Non-athletes N (15)
leptin ($ngml^{-1}$)	16±3	17±2
zinc ($\mu\ gdl^{-1}$)	202±77	169±37

Table 3 Correlations Between Plasma Leptin Levels and Plasma Zinc

	R	P
Athletes N (15)	**0.04**	**0.8**
Non-athletes N (15)	**0.2**	**0.4**

Spearman's correlation

Discussion

Hypoleptinemia is associated with chronic exercise independent of fat mass (17). This characteristic is also observed in subjects undergoing acute exercise, in which the duration of the stimulus is insufficient to decrease fat mass (18, 19). No changes wereobserved in the plasma leptin levels of the athletes after short term (2 h) moderate aerobic exercise or after intensive fitness andspeed exercise (20).In the present study, we did not observe any significant difference for plasma leptin levels between groups. This finding is consistent with previous exercise studies that have demonstrated no significant change after short term aerobic exercise or speed training(20). Leal-Cerro et al, stated that serum leptin levels significantly fell immediately after marathon run (17).Likewise, in a study conducted by Unal et al, on 10 professional football players and sedentary people, leptin levels of the exercising group were found to be lower than to the sedentary group (14). The authors of the concerned study concluded that regular exercise inhibited leptin levels (14). The reason why studies of the relation between exercise and leptin produced such different results may be explained by a variety of factors. Most important among these may be the intensity andduration of exercise and the time of blood collection. The main reason for the inconsistency between the findings of the aforementioned researchers and our findings is probably the fact that we collected the blood samples during rest.

It was demonstrated that long-term endurance training significantly reduced serum zinc levels in both males and females (21). Low zinc levels observed in endurance athletes may be explained by various mechanisms (22). It is known that there is further zinc loss with perspiration and through skin in athletes, in comparison to the not-sporting population (23). In the present study, we did not observe any significant difference for plasma zinc levels between groups.

Trace elements are possible mediators of leptin production in humans, although results are controversial (24, 25, 26)Zinc maybe a mediator of the effects of leptin, although the detailed mechanism is still unknown and requires further investigation (27). Koury et al, discovered the association between plasma leptin and plasma Zn in elite female and male judo athletes (27, 28). Bribiescas showed that 50mg zinc gluconate supplementation for 10 days did not have any effect on plasma leptin concentration (29). Similarly, Olusi et al. reported that there was not significant relation between serum zinc and leptin in healthy individuals (30).Our results are harmony with their findings. The fact that obese individuals were reported to have low zinc and high leptin levels (31) may be cited as evidence of a possible relation between zinc and leptin. Results obtained by Baltaci et al. who reported that plasma leptin levels were significantly inhibited in rats fed on a zinc-deficient diet support this argument (32). Further studies are required to investigate the detailed pathways of leptin and Zn in athletes.

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