



Association of Tumor Necrosis factor-alpha with Anthropometrical indexes in obese individuals

Zahedmanesh Forouzan, Golshin Elham and Ansari Ashraf

*Department of Physical Education and Sport Sciences, Islamshahr Branch,
Islamic Azad University, Islamshahr, IRAN*

(Corresponding author: Zahedmanesh Forouzan)

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ABSTRACT: Tumor necrosis factor-alpha (TNF- α) as pro-inflammatory cytokine has been shown that associated with type II diabetes, insulin resistance and metabolic syndrome. In this study, we aimed to determine association of serum TNF- α with anthropometrical markers in inactive adult obese men. For this purpose, fasting serum TNF- α and all anthropometrical markers were measured in twenty six adult obese men aged 39 ± 2 and body weight 94 ± 6.2 . Pearson's correlation coefficients were used to evaluate the correlations between serum TNF- α and other variables. A p-value < 0.05 was considered to be statistically significant. We observed that serum TNF- α was not correlated with all anthropometrical markers. Data of this study are controversial. Further studies are necessary to elucidate the significance of serum TNF- α in pathophysiology of obesity.

Keywords: Obesity, Body mass index, Inflammation, Metabolic syndrome

INTRODUCTION

Today the role of Obesity and overweight in prevalence of cardiovascular diseases and metabolic syndrome is well established. Clinical studies in adults have shown that chronic inflammation affects the pathogenesis of some diseases, such as Atherosclerosis, Diabetes, Cancer, some neurological diseases, cardiovascular diseases and diseases affecting the immune system [1]. Obesity increases the inflammatory cytokine secreted by adipose tissue and other body tissues, such as C-reactive protein (CRP), Interleukin 6 (IL-6, Tumor necrosis factor-alpha (TNF- α), Resistin and Interleukin-1 beta (IL-1B), which together lead to incidence and severity of the above mentioned diseases [2,3,4]. Research evidence reveals that these peptide components regulate energy balance and body weight by interfering with the mechanisms that regulate metabolism. Research evidence supports a close relationship between these inflammatory cytokines and visceral adipocyte size in obese individuals and other chronic diseases [5, 6].

Moreover, impaired secretion and systemic levels of these inflammatory markers cause to lipid disorders, especially in obese patients [7]. TNF- α is an inflammatory cytokine which is secreted by certain proinflammatory cells, such as macrophages and mast cells and is known as the cause of inflammatory response and immune system regulation, and its levels in obese individuals is significantly higher than those with normal weight. For the first time, the relationship

between Obesity and proinflammatory cytokine TNF- α and its role in the relationship between Obesity and inflammation were assessed by a study by Hotamisligil and colleagues [8].

This cytokine is known as a regulator of inflammatory responses of the body and plays an important role in the relationship between Obesity and inflammatory diseases, such as Diabetes, Metabolic syndrome, Atherosclerosis and chronic heart failure [9, 10]. On the other hand, some studies have not shown a significant difference in inflammatory or anti-inflammatory cytokine levels between obese and normal-weight individuals [11]. This lack difference has also been reported by other studies [12, 13, 14]. Given the contradictory findings concerning the comparison of cytokines levels, such as TNF- α between obese and normal-weight individuals and also the limited number of studies on relationship between them and the indicators of Obesity, This study analyzes the relationship between TNF- α , as a proinflammatory cytokine with anthropometric indices and body composition as determinants of obesity in obese men.

A. Subjects

Thirty one adult obese men aged 39.4 ± 2.4 year and BMI 31.4 ± 1.49 kg/m² were assigned in this study through local advertising. All subjects of two groups were inactive, non-smoker and non-alcoholics. Participants were included if they had not been involved in regular physical activity in the previous 6 months.

We also excluded people who had any self reported physician diagnosed chronic disease (arthritis, stroke, diabetes, hypertension, cancer, heart attack, chronic cough, or bronchitis). The study protocol was approved by the local Research Ethics Committee of Islamic Azad University and written informed consent was obtained.

B. Anthropometrics and laboratory

The measurements for weight, height, waist circumference were first performed, than fasting blood samples were taken for the determination of serum TNF- α . A detailed history and physical examination of each subject was carried out. Weight was measured to the nearest 100 g using digital scales. Height was measured with high precision with an error of ± 0.1 cm. The Body Mass index (BMI) was calculated using the formula body weight/height² in terms of kg/m². Percentage body fat was measured using body composition monitor (OMRON, Finland). Abdominal circumference (WC) was measured at the superior border of the iliac crest and was taken to the nearest 0.1 cm after a normal expiration. All of these measurements were conducted by the same researcher. Each of these measurements was conducted two times and the average was reported.

To determine TNF- α by ELIZA method, fasting blood samples were obtained after a overnight fast after a 12-

h overnight fast between the hours of 8 to 9 am. The inter- and intra-assay coefficients of variance were 6.0 and 6 % for resistin, 7.4 and 3.4% for TNF- α .

C. Statistical analysis

Statistic analysis was done with SPSS 15.0 for Windows. The Kolmogorov-Smirnov test was applied to determine the variables with normal distribution. Pearson correlations were used to establish the relationship between TNF- α concentration with anthropometrical indexes on obese subjects. A p-value less than 0.05 were considered statistically significant.

RESULTS

This study aimed to determine the relation of TNF- α with anthropometrical markers in obese men. Table 1 are showed anthropometrical markers and serum TNF- α values by mean and standard deviation. Significant of correlation of all anthropometrical markers with serum TNF- α were also showed in table.

Based on Pearson correlation methods, we observed that serum TNF- α is not correlated with body weight ($p = 0.17$, $r = 0.28$), abdominal circumference ($p = 0.87$, $r = 0.03$), BMI ($p = 0.11$, $r = 0.33$), body fat % ($p = 0.17$, $r = 0.28$) and the other anthropometrical markers in studied subjects (Table 1, Fig. 1).

Table 1: Mean and standard deviation of spirometric markers in studied groups.

Variables	Mean (SD)	Correlation with TNF- α	
		P	r
Age (year)	39.4 (2.4)	0.48	0.39
Height (cm)	173 (3.5)	0.69	0.08
Weight (kg)	94 (6.2)	0.17	0.28
Waist circumference (cm)	102 (5.4)	0.86	0.04
Hip circumference (cm)	103 (6)	0.86	0.03
Abdominal to hip ratio	0.99 (0.02)	0.87	0.03
BMI (kg/m ²)	31.38 (1.49)	0.11	0.33
Body fat (%)	31.5 (1.33)	0.17	0.28
Visceral fat	13.8 (1.74)	0.31	0.21
TNF- α (pg/ml)	38.3 (8.9-)	----	----

DISCUSSION

Previous studies have often shown higher inflammatory cytokine levels in obese individuals, healthy or sick than normal-weight individuals, and somehow support the Inflammatory or anti-inflammatory cytokine dependence on weight and body fat levels [8, 15-17]. However, the findings of this study, like some previous studies, which confirmed the lack of correlation between cytokines and anthropometric markers or body

composition [18] showed no relation between anthropometric indices and levels of TNF- α as an inflammatory cytokine. In other words, the present study didn't show a significant relationship between the serum levels of TNF- α and any of the anthropometric markers or body composition, such as weight, body mass index or body fat percentage in obese men studied.

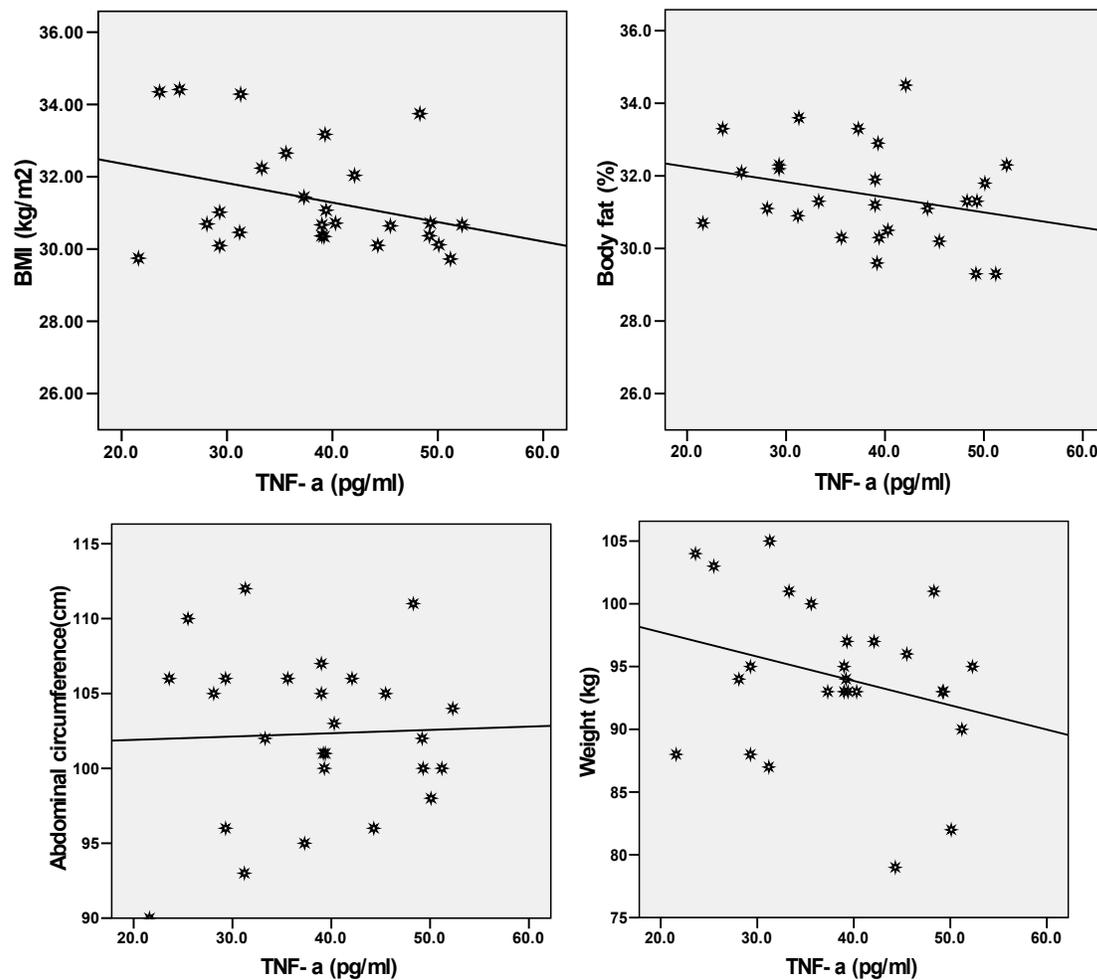


Fig. 1.

However, adipose tissue macrophages are known as the main source of this inflammatory cytokine secretion [19] and some studies have confirmed its 7.5-fold increase in obese than in lean subjects [20]. For the first time, the relationship between Obesity and TNF- α was mentioned in a study by Hotamisligil *et al.* which investigates its role in inflammation and Obesity [21]. These studies also have pointed to the potential role of TNF- α in increase of VLDL, which indicates its relationship with plasma triglyceride [20].

Some other studies, in addition to its importance in inflammatory processes caused by Obesity, have reported its significant reduction after weight loss [22]. However, no significant changes in the expression of TNF- α and its levels in skeletal muscle following a significant reduction in body weight of 5.4 to 5.12% of body weight have been reported by some previous studies [23]. However, researchers have noted that the lack of a significant effect of weight loss on inflammatory markers such as IL-6 and TNF- α in skeletal muscle could be due to low levels of

macrophages in skeletal muscle [24]. As a cytokine TNF- α levels higher in obese than in normal-weight individuals have been reported by some recent studies [25]. However, the weight loss in obese type 2 diabetes reduces the production of TNF- α and improves insulin resistance [26]. The findings of a recent study showed that plasma TNF- α levels in obese diabetics is higher by about 30% than the non-obese diabetics, but this increase is not only in response to Hyperglycemia and it's the Obesity phenomenon that alongside Hyperglycemia is responsible for the increase in TNF- α in these patients [27].

About the relationship between TNF- α levels with metabolic and physical markers of body, however, based on the opinion of some researchers, this inflammatory cytokine is presented as a marker to identify and determine the function of cardiovascular diseases [28], It is not yet clear to what extent the metabolic, inflammatory and anthropometric markers are involved with its synthesis, secretion and systemic levels.

The fact that fat tissue is the main source of some inflammatory cytokines, such as TNF- α have been reported by some studies [29, 30]. However, TNF- α expression in adipose tissue do not necessarily reflect its levels in blood circulation of obese individuals [21]. Also, in another study no significant difference in serum TNF- α level between normal-weight children and obese children or children with higher levels of fat were found [31]. In a previous study researchers, noting that waist circumference is not an Independent determinant of Circulating levels of TNF- α , pointed out that more important than obesity, it is clinical inflammation that's the main determinant of circulating levels of TNF- α in non-patients [17]. On the other hand, ignoring contradictory and Countercurrent findings, the lack of relationship between TNF- α and anthropometric indices in the present study can be attributed to the low number of subjects.

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