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Adiponectin in Relation to Lipid Profile Indexes and Body Composition in Middle-Aged Obese Males

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ABSTRACT

The objective of this study was to compare serum adiponectin between middle-aged obese men with normal weight subjects as well as determining the relationship between this hormone with anthropometrical and lipid profile obese group. Fasting glucose and serum triglyceride, total cholesterol, low and high density lipoprotein were measured in 45 obese male adults after 12 to 14 hours overnight fasting and their correlation with serum adiponectin levels were determined. Also, fasting serum adiponectin levels were measured in 35 male adults with normal weight men. All anthropometrical indexes were measured in all participants. Independent T-test method was used to compare adiponectin levels of obese group with normal weight group, and Pearson correlation was used to determine of adiponectin in relation to anthropometrical and biochemical variables in obese subjects ($P \leq 0.05$). Serum adiponectin concentration was significantly lower in obese subjects than none- weight subjects. Serum adiponectin had a negative significant correlation with total cholesterol, low density lipoprotein, glucose, and systolic and diastolic blood pressure and age of subjects ($P \leq 0.05$). The closely correlation between adiponectin and cardiovascular risk factors support this hypothesis that reduction of systemic levels of this hormone is associated with some cardiovascular risk factors.
KEY WORDS: cardiovascular risk factors, adiponectin, obesity.

INTRODUCTION

At present, adiponectin may be the most important and promising adipocytokine for obtaining a better understanding of the link between obesity and metabolic and cardiovascular disease (1, 2), however the biological basis for these processes is not fully recognized yet. So that it reserves body fat as triglyceride (TG) and drops them into the blood stream in the form of free fatty acids (FFA) when needed. This anti-inflammation cytokine has been shown to be secreted principally by visceral adipose tissue (VAT), the size of this visceral fat depot being an important correlate of plasma adiponectin levels (3). Moreover, adipose tissue also plays a role as an endocrine organ in the secretion of some biological activators of energy metabolism called adipocytokines such as leptin, resistin, ghrelin and adiponectin (4). Circulating levels of adiponectin is associated with visceral obesity and certain related metabolic abnormalities which contribute to the development of insulin resistance, type 2 diabetes and atherosclerosis (3). Adiponectin levels are correlated inversely with anthropometrical indices of obese subjects and insulin resistant. A Russian study showed that the adiponectin which is independent of other blood factors, play an important role in plasma TG levels. Yamamota et al. study revealed that the relationship between adiponectin and TG, LDL and HDL will be maintained even after matching age, sex and BMI, (5). But unlike the above findings, the statistical result of a recent study showed that despite the direct relationship of adiponectin with HDL, there is no relationship between this peptide hormone and other body weight indices, total cholesterol (TC) TG LDL, insulin resistance and anthropometrical indices. Absence of any relationship between serum adiponectin levels and body fat levels has been also observed in some other studies (6, 7). A recent study showed that the significant relationship of adiponectin with lipid profile indices (TG, TC, LDL, and HDL) is independent of BMI. The study of Ram et al. also showed that there is no significant correlation between fasting adiponectin levels with abdominal fat volume (7). Some other studies also suggest that the relationship of adiponectin with biochemical indicators of lipid profile (TG, TC, LDL, and HDL) is independent of body adipose tissue levels (8,9). These observations indicate a contradiction between findings about the relationship between adiponectin and lipid profile indicators and anthropometrical variables and there is still no general consensus regarding the relationship of this anti-inflammatory hormone with the mentioned indicators. Hence, the present study was also conducted to determine the relationship between the mentioned indicators in obese male adults.

MATERIALS AND METHODS

Forty five obese male adults (BMI $\geq$ 30) with age range of 37 to 48 years old participated in this study randomly. Study inclusion criteria include non-athletic, non-smoker individuals with no chronic disease such as diabetes, asthma and kidney disease and no orthopedic abnormalities. Not participating in regular sports activities within at least last six months was also another study inclusion criterion. 31 non-obese male adults with normal weight

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(20 ≤ BMI ≤ 25) with similar age conditions as the obese group also participated in the study in order to compare the baseline levels of serum adiponectin in the studied obese subjects with that of normal subjects. To run this study, anthropometrical indices in subjects were measured first. So that Weight of the studied subjects was measured in minimum clothing using made in Taiwan digital height meter scale with 100 grams accuracy. Subjects' height was measured while barefoot using height meter scale. Body mass index (BMI) was calculated through dividing body weight (kilograms) by squared height (square meters). Abdominal circumference and hip circumference were measured in the most condensed part using a non-elastic cloth meter. Also, Waist to hip circumference ratio (WHO) was calculated through dividing the abdominal circumference by hip circumference. Subjects were asked to avoid doing any heavy physical activity for 48 hours before blood sampling. The studied subjects were requested to come to the Hematology Laboratory between 8 to 9 am after 12 to 14 hours overnight fasting in order to measure biochemical variables. Then, 8 cc bloods were taken from the subjects' brachial vein to measure fasting adiponectin and lipid profile indicators including (TG, TC, LDL, and HDL). Glucose level of fasting blood was measured through glucose oxidase enzymatic method (Pars Azmoon kit). Independent T-test was used to compare the baseline serum levels of adiponectin in obese group with that of subjects with normal weight. Linear regression test was also used in version 15 SPSS statistical software environment to determine the relationship between serum adiponectin levels with each anthropometrical indices or biochemical variables of lipid profile.

RESULTS

Mean and standard deviation of anthropometrical characteristics, biochemical variables as well as significance levels of the studied variables with serum adiponectin in obese patients have been summarized in table 1. First, baseline levels of adiponectin in obese subjects was compared with that of normal weight subjects, and findings from the independent statistical T test showed lower levels of adiponectin in obese subjects than subjects with normal weight (5.44 ± 1.23 in the obese group vs. 7.56 ± 1.32 in the normal group, p = 0.021). These findings indicate decrease in adiponectin levels in obese subjects. The findings also showed a significant negative correlation between serum adiponectin levels and total cholesterol (p = 0.041). Significant inverse relationship was also observed between adiponectin and fasting LDL levels (p = 0.025). However, the relationship of adiponectin with other lipid profile indicators such as HDL and triglyceride was not significant. On the other hand, the findings showed that decrease in serum adiponectin levels in studied obese subjects is associated with significant increase of fasting glucose (p = 0.042). Also decrease in adiponectin concentration was associated with increase of Systolic blood pressure (p = 0.001) and diastolic blood pressure (p = 0.023) of the studied subjects. Findings from regression analysis showed that although the relationship between adiponectin and each one of the anthropometrical indices is linear and reversed or in other words, an increase in the indicators such as Abdominal circumference, body mass index and Waist to hip circumference ratio (WHO)is associated with decrease in serum adiponectin levels, but the interaction between this hormone and each one of the mentioned variables is not significant separately, which may be due to the high standard deviation or few number of studied samples. Statistical findings also showed that serum adiponectin has a significant inverse relationship with triglyceride ratio to HDL (p = 0.027).

Table 1: Anthropometrical characteristics, biochemical variables and significance levels of each one of the variables with baseline serum adiponectin in the studied obese patients

Variable	Mean ± Standard deviation	Range	significance level with adiponectin	intensity correlation (R)
Weight (kg)	100 ±13.64	86-112	0.081	0.191
Height (cm)	173 ± 12	167-185	0.481	0.211
Systolic blood pressure (mmHg)	120. ± 10	11-14	0.001	0.573
Diastolic blood pressure (mmHg)	89 ± 9	7-10	0.019	0.449
Abdominal circumference	107 ± 9.89	101-132	0.092	0.193
hip circumference	108 ± 8.46	102-121	0.113	0.237
WHO	0.99 ± 0.02	0.96-1.02	0.117	0.298
(kg/m^2)Body mass index	33.41 ± 3.59	30-36	0.215	0.238
Body fat Percentage (%)	32.64 ± 4	28-36	0.098	0.214
(mg/dl)Total cholesterol	184 ± 27	118-230	0.041	0.497
Triglyceride (mg/dl)	168 ± 35	114-240	0.201	0.271
Low density lipoprotein(mg/dl)	125 ± 21	101-165	0.205	0.563
high density lipoprotein(mg/dl)	44 ± 3.94	39-48	0.093	0.262
Glucose (mg /dl)	104 ± 9	85-114	0.042	0.542
TG/HDL	3.82 ± 1.35	2.44-5.43	0.028	0.534
Adiponectin (µg /ml)	5.88 ± 1.23	4.71-6.30	---	----

DISCUSSION AND CONCLUSION

In this study, the role of anthropometrical factors and blood lipid levels on serum adiponectin was studied in middle-aged obese males. The Initial finding of this study was baseline serum adiponectin were significantly lower in obese male adults compared with their peer men with normal weight. This finding indicates the independent impact of obesity on this anti-inflammatory hormone. Adipose tissue recognized as an important endocrine organ that secretes a number of biologically active "adipokines" (9). Among these adipokines, adiponectin has recently attracted much attention because of its antidiabetic and antiatherogenic effects and is expected to be a novel therapeutic tool for diabetes and the metabolic syndrome (10). Although this study results support low serum adiponectin in obese subjects, once the independent relation of each one of factors affecting obesity such as BMI or abdominal circumference was examined with serum adiponectin separately, it became clear that although their relationship with adiponectin was linear and reverse or in other words, increase of the levels of anthropometrical indices is associated with decrease in serum adiponectin levels, this relationship was not statistically significant. These findings show that combination of a set of determinants of obesity with one another leads to reduction of adiponectin levels in obese subjects. In fact, relying on the serum adiponectin levels being lower in obese individuals than subjects with normal weight in this study, it can be concluded that obesity has been a decisive factor in adiponectin reduction in the studied subjects. But since the relationship of adiponectin with each anthropometrical component of body is reverse but non-significant, it may be concluded that although in this study increase of each obesity indicating factor is not determining the reduction of serum adiponectin levels in obese individuals in itself, increase of these obesity determinants levels next to each other reduces serum adiponectin levels in obese subjects significantly compared to subjects with normal weight. In other studies, reduction of serum or plasma adiponectin levels has been also observed in obese populations (11). Another major aim of this study is to determine the relationship between lipid profile indices and adiponectin levels in the studied subjects. In this regard, our study results showed that despite the inverse linear relationship between serum adiponectin and fasting triglyceride levels, this relationship is not significant. Absence of significant relationship of serum adiponectin with HDL levels was also observed in this study. These finding state that determination of triglycerides levels and blood HDL are not appropriate predictive indicators for serum adiponectin. On the other hand, despite the inverse relationship of serum adiponectin with TG and HDL in this study, non-significance of this relationship may be because of low number of studied samples. But despite the lack of significant relationship of serum adiponectin with HDL and triglyceride levels in these individuals, the statistical tests indicated a significant inverse relationship between total cholesterol and LDL levels and serum adiponectin concentrations. So that increase in blood total cholesterol level leads to reduction of serum adiponectin as one of the indices of determination of blood cycle lipid levels. In this field, Rubin et al. study showed that increase of total cholesterol levels is associated with decrease in adiponectin levels (12). Despite the lack of significant relationship of adiponectin with triglycerides and HDL indices in this study, statistical findings showed that adiponectin levels of studied obese subjects have a reverse significant relationship with triglycerides ratio to high density lipoprotein (TG / HDL) which is of the determinants of cardiovascular disease (13). Some study support that circulation adiponectin are also is positively associated with lipid profiles and decreased concentrations of inflammatory markers, suggesting that adiponectin may affect cardiovascular disease by modulation of plasma lipids and low-grade, chronic inflammation (14). Much evidence suggests that low adiponectin plasma concentrations are associated with high concentrations of HDL cholesterol (HDL-c) and low concentrations of triglycerides (15, 16). This study also showed that age is also reversely related with adiponectin levels so that blood adiponectin concentration would be reduced In line with age increasing. The findings of this study also showed that decrease in serum adiponectin levels is associated with increase of blood pressure and fasting glucose level of the studied subjects. The Inverse relationship of adiponectin with blood pressure in obese patients has also been observed in the study of Lee et al (17). In an overall summing up, the findings of this study along with most previous findings indicate decrease baseline adiponectin levels in obese subjects compared with those with normal weight. at the end, it can be said that although in the present study on obese subjects, cause for obesity and increase of total cholesterol levels and LDL was associated with significant decrease in adiponectin levels and findings indicate significant inverse correlation of adiponectin and with lipid profile indicators, the relationship of peptide hormone with other components, lipid profile or anthropometrical indices of studied subjects was week and despite the present findings, there are still unclear points in this regard there which reminds the requirement for further studies with more samples.

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